Instruments

THE MAGAZINE OF

Measurement and Control

Vol. 14
JAN.
1941
No. 1

SPECIAL ISSUE · · IN TWO PARTS · · PART ONE

Speeding Up National Defense THROUGH Instrumentation

IN THE SERVICE OF NATIONAL DEFENSE

BECAUSE of the contribution TAG has made in automatic control, practically every Industry engaged in America's National Defense Program operates more effectively . . . and, with greater precision, more speed and less waste. More than 160 years of thermometer making live behind the TAGliabue name. . . . Nearly half a century of service to Industry sponsors its scores of Indicating, Recording and Controlling Instruments for temperature, pressure, time, level and flow.

These traditions and achievements in the past serve only as a spur today in anticipating and meeting Industry's needs for increasingly effective Instrumentation.

As a primary function of all Instrumentation, TAG recognizes this national emergency and has geared its thinking, research and resourceful development energies to meet it promptly.

Below are listed some of the many TAG Instruments now in service in National Defense Industries.

TAG PRECISION INSTRUMENTS OF TOMORROW - READY FOR INDUSTRY TODAY

TAG INSTRUMENTS FOR THE PLANT

BAROMETERS
- Mercurial

CONTROLLERS
- Flow
- Humidity
- pH
- Liquid Level
- Pressure
- Temperature
- Vacuum

DIAL-INDICATING THERMOMETERS

FLOW INSTRUMENTS
- Controllers
- Indicators
- Integrators
- Meters
- Recorders

GAGES, RECORDING
- Pressure
- Temperature
- Vacuum

HYDROMETERS

HYGROMETERS
- Wet & Dry Bulb Thermometers

LIQUID LEVEL
- Controllers
- Indicators
- Recorders

MERCURIAL GAGES
- Absolute Pressure
- Mercurial Vacuum

MOISTURE METERS, Electric, for instantaneous moisture determination of Wheat, Corn, Barley, Other Grains and Seeds; Tobacco, Wood and Miscellaneous Granular Material

POTENTIOMETERS
- Controlling
- Indicating
- Recording
- Self Balancing

PYROMETERS
- Controlling
- Indicating
- Recording
- Resistance
- Thermoelectric

PSYCHROMETERS
- Recording

RECORDERS
- Electric
- Flow
- Humidity
- pH
- Hygrometer
- Liquid Level
- Pressure
- Temperature
- Vacuum

REGULATORS (See Controllers)

STEAM TRAPS

THERMOMETERS
- Chemical
- Dial
- Electric
- Expansion Stem
- Indicating
- Industrial
- Recording
- Resistance

TIMERS
- Time-Operation Recorders

VALVES
- Diaphragm
- Automatic Safety Shut-Off
- Reducing
- Pressure
- V-Port
- Three-Way
- Water Circulating

TAG INSTRUMENTS FOR THE LABORATORY

- Acid Heat Test Apparatus
- A.P.I. Hydrometers
- Asphalt Testing Apparatus
- Barometers (Mercurial)
- Burning Test Apparatus
- Carbon Residue Apparatus
- Centrifuges, Laboratory
- Centrifuge Tubes
- Cloud & Pour Test Apparatus (Cold Test)
- Colorimeters (Light Oils and Lubricating Oils)
- Cylinders, Graduated
- Cylinders (Hydrometers)
- Dew Point Apparatus
- Distillation Apparatus (Gasoline, Kerosene, Gas Oil)
- Emulsification Apparatus
- Flash & Fire Point Apparatus
- Flasks, Viscosity
- Fuel Oil Testing Apparatus
- Grease Testing Apparatus
- Gum Test Apparatus

HYDROMETERS
- Acid
- Alcohol
- Alkali
- A.P.I.
- Baumé
- Calcium Chloride
- Glue
- Milk
- Petroleum Products
- Salt
- Sea Water
- Sugar
- Syrup
- Tanning Liquors
- Turpentine
- Wort

- Hygrometers or Wet & Dry Bulb Thermometers
- Jars (Hydrometer)
- Laboratory Apparatus & Supplies
- Lactometers
- Meters, Moisture
- Oil Testing Instruments
- Penetrometer
- Rods, Gage
- Saccharometers
- Samplers, Oil
- Saybolt Testing Apparatus
- Sulphur Test Apparatus
- Stop Watches, Mechanical
- Stop Watches, Electrical
- Testing Apparatus, Oil
- Testers, Oil
- Testers, Flash Point

PYROMETERS
- Controlling
- Indicating
- Recording
- Resistance
- Thermoelectric

THERMOMETERS
- Chemical
- Cup Case
- Electric
- Industrial

- Thermostatic Viscosimeter
- Timers, Operation
- Tubes, Centrifuge
- Vapor Pressure Apparatus
- Viscosimeters, Saybolt
- Wax Melting Point Apparatus
- Water & Sediment Apparatus
- Wet & Dry Bulb Thermometers

SINCE TAG *1769*

C. J. TAGLIABUE MFG. CO.

Park & Nostrand Avenues

Brooklyn, N. Y.

INSTRUMENTS The Magazine of MEASUREMENT and CONTROL

Published Monthly by **The Instruments Publishing Co.,** 1117 Wolfendale St., Pittsburgh, Pa.

INDEX TO VOLUME 14—1941

Month	Pages	Month	Pages	Month	Pages	Month	Pages
January	1-28	April	83-106	July	193-216	October	271-324
February	29-50	May	107-140	August	217-240	November	325-380
March	51-82	June	141-192	September	241-270	December	381-408

SUBJECT INDEX

A

Actuator, Roller-arm, A-c. and D-c. Switches 246
Adapter, 90°, for Stem-type Temperature Controller 108
Aeronautics, Scope of Instrumentation in 271
Aircraft Instruments, General Consideration of 274
Aircraft Radio Tests, Single Unit for Numerous 286
Air-inclusion Errors in Liquid-filled Thermometer Systems 71
Alarm, Wireless, Portable 383
Ammeter, Multi-range A-c. 34
Analyzer, Surface 33
Angular Sweep for Oscilloscopes 388
Anti-vibration Mounting of Airplane Instruments 294
Averting Several Weeks' Delay in Starting Up New Defense Plant 101

B

Balancing Machines 322, 390
Balancing Unit for Balancing Machines on Own Pedestals 389
Battery Chargers, Auto 199
Books on Instrument Servicing (Letters) 104
Bridge, A-c. Recording 86
Bridge, Capacity 110
Bridge, Limit 32
Bridge, Limit, Production Testing 322
Briquetting Press, Specimen 32
Bushing Test Set 200

C

CAA and Industry Cooperate to Develop Instrumentation 272
Calibrating Vibration-measuring Instruments over a 30-to-1 Frequency Range 280
Calibration Chamber, Temperature-altitude Test 384
Calibration of Weights, Resistors and Continuous-scale Instruments 40
Camera, Electronic Vacuum 114
Capacitor, Decade 390; capacitor mounting 249
Capacitors, Bakelite Mica-dielectric 112; Temperature compensating 389; Electrolytic 63; Midget molded 204; Oil-filled 62
Cathode-ray Tube Screens 244
Checking Furnace, Thermocouple 86
Chronograph with Inertialess Marking System 245
Cleaning and Drying Apparatus 245
Clock, Aviation, Elapsed-Time 34
Coil Winders, Combination Universal 323
Combination Visual and Autometric Method of Optical Pyrometry 69
Combustion Furnace, Two-tube 85
Computing Device for Electrical Work 26
Conductivity Apparatus for Distilled Water, etc. 204
Conductivity Cell, Fill-type 388
Control, Automatic, for Sodium Lights 109; —System for pulverizing machine feeders 244
Controller, Air-operated 383; Automatic liquid-metering recycling 56; Automatic balance restoring 39; Combined liquid level and pressure 27; Concentration 88; Automatic level 326; Electric contact type pressure 203; Ratio, direct-set 111; Automatic time welding 31; Float-type liquid level 52; Liquid level 32; Process program 220; Automatic time 142; Time cycle 220
Counter, Electric 109; Electronic high-speed 31, 223; High-speed coil winding 197; Production, photoelectric 116
Cutting Emergency Fuel Supplies into Service 98

D

Densitometer-photometer, Spectrograph Plates 115
Dosage Meter, Ray 222
Drafting Machine 59
Dynamic Balancing Equipment 221
Dynamometers, Tension 109

E

Early High-frequency Prime-relay Control System (Letter to the Editor) 74
Educational and Training Courses 42
Education and Training—Brief Items 78
Electroencephalograph 201
Electromagnetic Balance—A High-precision Measurement and Control Device 281
Electronic View-finder for Television Camera 202
Elimination of the Viscosity Error in Flow Measurement with Rotameters 65
Engine Instrument Tests, 288
Exhaust Analyzers, Fuel-air Ratios 320

F

Factors Affecting the Accuracy of Differential-type Frequency Meters 208
Fan Control, Two-speed 390
Fermentometer, Vitamin B_1 323
Filters, Plug-in 56
Film Dryer, Spectrochemical Analysis 60
Fitting for Stem-type Temperature Controller 108
Flowmeter, Integrator 250; Ring-balance 195
Fluorescence Meter, Vitamins B_1 and B_2 58
Fluorescent Spotlight for Inspection 12
Flying Laboratories 307

G

Gage Blocks and Optical Flat Combination 218
Gage, Dial, for large work 383; Dial snap 62; Electric thickness 204; Pneumatic comparator 224; Thickness, sheet-steel 64
Gage, Draft, Transparent Pocket 194
Gage, Electrode Pressure 199
Gaging, Defense Production 252
Galvanometer, Multiple-reflection 36; Reader unit 110
Gas Alarm, Explosion-proof 26
Generator, L-f. Linear Time-base 243; Ultrasonic energy 84; Vibration energy 84; Signal 386

H

High-speed Cathode-ray Oscillograph, Bureau of Standards' New 205
Hydraulic-System Test Instrumentation 292
Hydraulic Transmission 319
Hydrogen Ion Control Converts a Batch Process to Continuous-flow 15

I

Ice Cream Freezer Instrumentation (Letter to the Editor) 74
Ignitron Tubes, Welder Control 56
Illuminator-magnifier 33
Immersion Heater 31
Increasing by 80% the Output of Steel Annealing Furnaces 3
Indicator, Angle Form Direction 219
Indicator Base, Magnetic 111
Indicators, Dial 60, Dial Test 26
Indicator, Ironer Pressure 320
Indicator, Midget 57
Indicator, Multiple-instrument 317
Indicator-Recorder, Dehydrator Water pH 316
Indicators, Flow 31, 59
Industrial Instrumentation Course at Case 122
Instrumentation at the Nuttall Gear Works (Pictorial Feature) 117
Instrumentation Contest Report, Third Annual 2
Instrument Flight Training for TWA First Officers and Captains 290
Instrument Instruction at M. I. T. 278
Instrument Requirements for High-frequency Power Applications 292
Instrument Work Innovations 276
Integrator for Circular Ordinates 121
Interference Locator 36
Iron Finder, Tramp 115

M

Magnetic Indicator Base 111
Magnetometer 61
Magnifier, Illuminated 387
Maintenance Procedure, Outline of AA's 286
Maintenance and Servicing of Electrical Instruments 226, 255, 394
Meter, Combination Watthour and Thermal Demand 387; Demand, time-interval mechanism 246; Fluorescence, Vitamins B_1 & B_2 58; Moisture 218; Ray Dosage 222; Smoke, Photoelectric and Combustion Control 221; Wet Test 60
Metering Outfit, Self-powered Explosion-proof "Xacto-pack" 34
Micromanometer with Illuminated Water-surface Locators 37
Micrometer, Rubber and Soft Materials 224
Microscope, Electron 64; Polarizing 221
Minimizing Errors in Metering Pulsating Flows 206
Modernization of Instrument Boards 207
Moisture Tester, Plaster, etc. 34
Motors, Fractional H-p. 33
Multi-range Rheostat with Rotating Dial 100

N

New Methods & Instruments in Mechanical Laboratory Instruction, Plea for 2"5
New Method of Determining Voltage and Phase Relations in an A-c. Bridge Network 89

O

Open-hearth Two-meter Combustion Control 98
Oscillograph, Blackout-Panel 388

P

Permeameter 86; Fabric 248
Photocells, Recent Progress in Applications of Dry-disk 210
Photoelectric Inspection and Register Control 220
Photoelectric System, Flame-failure Safety 61
Photofluorometer, Electronic 390
Photographic Recording of Transients from Cathode-ray Tube Screen 309
Photometer, Transmission 35; Vitamin A Concentration 56
Plate Choke, 2½-meter R-f. 248
Polarimeter, Lippich Half-shade Polarizer 244
Potentiometer, Multi-circuit Self-balancing Indicating 247; Portable Pyrometer 31; Recording Glass Lehrs 113; Round Chart 204
Pressure-transmission Lag in Remote-indicating Pressure-spring Thermometers 91
Production Testing, Automatic Safety in 16
Production Test for Case Depth, Rapid 8
Proper Connections Increase Value of Gages 94
Proportioner, Electrically Controlled Chemical 196
Protecting Tube, Thermocouple 86
Pumps, Fractionating 52
Pyrometers, Diesel Engine 322

R

Recorder, CO_2, Improved 385; Flow, Pressure and Temperature 223; Inkless Portable 218; Moisture-content for Tentered Cloth 204; Oxygen Concentration 64; Pulse-rate 243; Flight Data 318
Rectifier, Production Testing 112
Regulator, Air, Small-volume 36; Line-voltage, Lightning Protection 194; Pressure-reducing 219; Three-element for Heating Control 391
Relay, A-c. or D-c. 218; Air Conditioning Stoker Timer 198; Aircraft Type 316; High-speed Directional 202; Midget Latch-in Electrical Reset 198; Midget Ratchet 110; Photoelectric 34; Photoelectric Lighting 108; Power 194; Midget Magnetic 317; Motor Reversing 88; Temperature 88; Vibration-proof 195
Residue Apparatus, Carbon 87
Resistance Standards 108
Resistors, Live- and Dead-bracket 112; Negative Temperature Coefficient 316; Plug-in Tube-type 58; Sealed Voltmeter 383
Resistor Units 250
Rheostat, 500-watt 36; Generator Field 55

S

Safety Inspection of Trains en Route 12
Sand Sampler, Molding 57
Saving Fuel with a Pyrometer 93
Scratch Hardness Test for Case Depth 18
Screens, Cathode-ray Tube 244
Shop Measurements Outfit 196
Solenoid for Operation and Control 390; Starter 114
Spectrograph, Two-lens Quartz 249
Speeding Up Gasoline Pipe Lines 22
Speed Measurement on Synchronous Motors 96
Stop Clock 251
Stopwatch, Electric 194
Strip-chart Tear-off Feature, Daily or Batch 198
Stroboscope Tests Dynamic Unbalance in a Large Water-wheel-driven Generator 14
Sulphur Determination Apparatus 34
Surface Plate 243
Switch, D-c., Conduit Style Case 222; Double-flow Mercury 320; Mercury 54; Lever, Heavy-duty 383; Mercury Midget 54; Micro, Splash-proof 222; Precision 223, 384; Roller-arm Micro 60; Time 84

T

Tachometer, Electric 84, 197; Hand 110
Tachometers with the Oscilloscope, Calibrating 302
Tear-off Device for Strip-Chart Recorders 53
Telemetering System, Differential Pneumatic 196
Television Screen, "White-Delay" 31
Temperature Control, Can-filling Machine "Tipper" 113; Adjustable-mode Type 33; Throttling Fuel Heat 388; System for Plating Tanks 196
Tester, Diaphragm, Electronic Micrometer 321; Dynamic Hardness 200; For Coin-operated Amusement Devices 385; General purpose 108; Ground resistance 35; Hydrostatic, Cylindrical Bodies 243; Multi-range 248, 384; Paper Size 386; Pocket Size Appliance 116; Portable Hardness 53; Pressure Gage, Impulse-method 57; Bond 251; Surface-finish 64; Wire Insulation 63
Test Flight Data Automatically Filmed 301
Testing a Complete Fuel System 309
Testing Set, Radio 26
Thermal Switch, Submersion 87
Thermocouples, Aircraft 298; Molten Glass 55; Wire and Desk Assemblies 224
Thermometer, Beckmann 52; Sanitary 218; Recording 54
Thermoregulator, Mercurial 35
Thermostat, Appliance 194; Cartridge Type 108; Clock 248; Cooling, Demand-compensated 247; Humidity-compensated 35; Surface 27
"Three-point Method" of Measuring Bores 6
Time Automatic Control's Friend & Foe 125
Time Delay Switch 88
Timer, Industrial 246; Interval, Dust and Moisture Proof 32; Millisecond 58; Plastic Presses 246; Automatic 384; Double-reset 54; Electrical 36
Transformer, Current 391; Potential 198; Tiny 243; Variable Voltage, Full Wave 386
Tungsten Production from American Ores Increased by Instrumentation 10
Tuning-fork-controlled Time Standard 62
Two Needles Are Better Than One 282

U

Use of a Standard Rectifier Type A-c. Microammeter as Averaging Device 11

V

Valve, Micro-action for Gages and Governors 202; Motorized 62; Positioner 114; Multiport 201; Power Control 386
Varitime, Soren, A-c. Source 36
Vibrators, "Push Pull" 200
Vibrometer 194, 316
Voltage Regulator 59; A-c. 322
Voltmeter, Phasing-out 26
Voltohmmeter, Electron-tube, Multi-purpose 87
Volt-ohm-milliammeter, A-c. D-c. 263

W

Water Still, Automatically-controlled Laboratory 112
Welding Synchronizer 85
Welding Timer, Ignitron Combination 383

AUTHOR INDEX

A

Abrahamson, Robert 100
Ackermann, Otto 205
Acro Electric Co. 222
Aerovox Corporation 62, 63, 389
Allen-Bradley Co. 114, 326
Allen Electric & Equipment Co. 199
American Gas Accumulator Co. 142
American Instrument Co. 62, 323
American Meter Co. 60, 326
American Schaeffer & Budenberg Instr. Div., Manning, Maxwell & Moore, Inc. 142
American Timer Corp. 143
Ames Co., B. C. 60
Andrews & Perillo Inc. 84, 115
Arca Regulators, Inc. 327
Arco Electric Co. 384
Askania Regulator Co. 328
Associated Research, Inc. 35
Automatic Control Co. 329
Automatic Electric Co. 109, 143, 195
Automatic Electric Mfg. Co. 144
Automatic Temperature Control Co., Inc. 144, 330

B

Bacon, Emra D. 146
Bailey Meter Company 332
Bank, John C. 61
Barber Colman Co. 53, 62
Barnhart, J. R. 89
Bastian-Blessing Co. 334
Behar, M. F. 1, 29, 51, 83, 107, 123, 141, 142, 193, 217, 241, 271, 325, 326, 281
Belfield Co., H. 334
Bender Warrick Corp. 334
Betts & Betts Corp. 88, 146
Billstein, A. E. F. 12
Bin-Dicator Company, The 336

Blade, Ellis 40
Blechman, Seymour 65
Bowman, Rush A. 252
Bowser & Co., Inc., S. F. 34
Brabender Corp. 35
Braun Corporation 34
Bristol Company, The 33, 54, 147, 220, 246, 322, 336
Brombacher, W. G. 271
Brown Instrument Co. 55, 61, 113, 149, 196, 204, 221, 337
Brush Development Co., The 33
Builders Providence, Inc. 340
Burling Instrument Co. 108
Burrell Technical Supply Co. 251

C

Cambridge Instrument Co. 64, 248, 320
Campbell Co., J. A. 202
Clare & Co., C. P. 149
Clark, E. W. 208
Clarostat Mfg. Co., Inc. 31, 58, 194
Clifton, Donald F. 18
Coats Machine Tool Co., Inc. 116
Cochrane Corporation 59, 196, 341
Coleman Electric Co., Inc. 390
Commonwealth Engineering Co. of Ohio 36
Consolidated Safety Valve Div., Manning, Maxwell & Moore, Inc. 386
Controls, Inc. 150
Core, Ralph 286
Cornell-Dubilier Electric Corp. 112, 204, 249
Cramer Co., Inc., R. W. 32, 54, 150, 384

D

Davis & Co., Inc., Dean W. 390
Davis, Hugh 290
Davis Regulator Company 342
Dedek, Frank 8
Defender Automatic Regulator Co. 203, 342
d'Este Company, Julian 344
Diehl, Charles E. 15
Dietert Co., Harry W. 32, 57, 60, 85
Dillon & Co., Inc., W. C. 109
Distillation Products, Inc. 52
Dorr-Patterson Engineering Co. 243
Drafto Company, The 59
Draper, C. S. 278
Du Mont Labs., Inc., Allen B. 31, 202, 243, 244, 309, 388
Dumore Company 33
Dunn, Inc., Struthers 88, 110, 152, 198
Dupen, V. C. 3
Durakool, Inc. 54, 320
Durant Mfg. Co. 116
Dwyer Mfg. Co., F. W. 194

E

Eagle Signal Corp. 153, 246
Eastman, Fred S. 284
Edgerly, H. S. 267
Edison, Inc., Thomas A., Instrument Div. 153
Edwards, L. V. 218
Eggleston, Morey 288
Electric Controller & Mfg. Co. 154
Electric Switch Corp. 154
Electro-Medical Laboratory, Inc. 201, 245
Electronic Products Company 344
Elematic Mfg. Co. 86, 224
Engineering Laboratories, Inc. 86
Estep, Thomas G. 225

F

Fenwal Inc. 87
Ferner Co., R. Y. 200
Fischer, Kermit 65
Fisher Governor Company 155, 344
Foster Engineering Co. 219, 345
Foxboro Company, The 155, 345, 383
Frick Company, Inc. 348
Friez & Sons, Julien P. 35, 156, 318, 348
Fuller Company 348

G

Gaertner Scientific Corp. 249
General Controls 348
General Electric Co. 26, 34, 35, 36, 56, 63, 64, 86, 88, 109, 114, 115, 156, 197, 199, 204, 218, 221, 246, 247, 349, 391
General Thermostat Corp. 194
Geophysical Instrument Co. 222
Glaser, Edward M. 302
Globe Tool & Engineering Co., The 322, 323, 390
G M Laboratories, Inc. 218, 316
Grove Regulator Co. 36
Guardian Electric Mfg. Co. 157, 349

H

Hanlon-Waters, Inc. 349
Hardwick-Hindle, Inc. 36
Hart Moisture Gauges, Inc. 34
Henszey Company 31
Herzog, Eugene 96
Hickok Electrical Instrument Co. 26, 203
Holling, H. E. 98

I

Industrial Instruments, Inc. 88, 204, 388, 390
Industrial Timer Corp. 36, 158
Inferno Company, The 350
Instrument Specialties Co., Inc. 224, 321
International Filter Co. 350
International Resistance Company 383
International Time Recording Div., International Business Machines Corp. 158
Isaacs, Selig H. 22, 98

J

Jarrell-Ash Company 110
Johnson Service Co. 158, 350

K

Kelly, R. D. 298
Keystone Carbon Co. 316
Kieley & Mueller, Inc. 352
Klemin, Alexander 274
Kliever, Waldo H. 121
Klipfel Manufacturing Co. 352
Kollsman Instr. Div., Square D Co. 34, 219
Kurman Electric Co. 194

L

Lamb, Anthony H. 210
Leeds & Northrup Co. 31, 53, 86, 159, 200, 247, 316, 353, 385
Lescher, George W. 301
Leupold, Volpel & Co. 353
Lipstein, Eugene 65
Littelfuse, Inc. 54
Lovejoy, E. F. (Obit.) 92
Luers, J. Milton 159
Lumenite Electric Co. 354
Lunas, L. J. 392

M

Machlet, George A. F. 74
Maher, James F. 93
Major, R. W. 286
Marsh Trittrol Company 391
Mason-Neilan Regulator Co. 159, 354
McAlear Mfg. Co., The 357
McDonnell & Miller 357
Measurements Corporation 386
Melas, William 206
Mellaphone Corp. 111, 112
Mercoid Corporation, The 358
Merco Nordstrom Valve Co. 201
Mercon Regulator Co., The 359
Micro Switch Corp. 60, 222
Miller, C. O. 122
Mine Safety Appliances Co. 26, 57
Minneapolis-Honeywell Reg. Co. 160
Mizzy, Inc. 33
Mobile Refrigeration, Inc. 384
Moisture Register Co. 218
Monitor Controller Co. 160
Moore Products Co. 52, 114, 224, 360
Morey & Jones, Ltd. 360
Morey, Francis C. 37
Morton, Henry I. 94
Mosher, Max 244
Mossman, Inc., Donald P. 383
Mu-Switch Corp. 222, 246

N

National Supply Co. 160
Nisbet, Carl 276
Northern Equipment Co. 361
Northwestern Clock Co. 162

O

Ohmite Manufacturing Co. 26, 55, 112, 248

P

Paragon Electric Co. 84, 162
Partlow Corporation 162
Penn Electric Switch Co. 198, 362
Perfex Corporation 162, 248, 390
Permutit Co., The 56
Philadelphia Thermometer Co. 52
Phipps & Bird, Inc. 243
Photoswitch Incorporated 164, 220, 363
Photovolt Corp. 56, 58, 164
Precision Apparatus Co. 34, 248, 384
Precision Scientific Co. 194
Production Instrument Co. 164, 197

R

Radio City Products Co., Inc. 87, 116, 385
Rath, W. T. 292
Rawson Electrical Instrument Co. 58
RCA Manufacturing Co. 64
Reading-Pratt & Cady Division, American Chain & Cable Co. 363
Rehtron Corp. 221
Reliance Gauge Column Co., The 364
Republic Flow Meters Co. 365
Rhodes Incorporated, M. H. 164
Rimbach, Richard 42
Ring Balance Instrument Co. 195, 223, 250
Roberts, Willmar K. 39
Rolnick, H. A. 71, 91
Rosales Co., George 320
Rowan Controller Co., The 367
Rowe Radio Research Laboratory Co. 383, 388
Ruggles-Klingemann Mfg. Co. 367

S

Sangamo Electric Co. 166
Sashoff, Stephan P. 39
Sayler, William H. 10, 74
Schade Valve Manufacturing Co. 368
Schaub Engineering Co., Fred H. 32, 368
Scherr Co., George 26, 196, 218, 383, 387
Seely Instrument Co. 168
Shallcross Mfg. Co. 31, 32, 108, 223, 251, 322
Sherer, Clayton M. 14
Shobert II, Erle I. 69
Shrader, Ray C. 282
Simplex Valve & Meter Co. 370
South Bend Tool & Die Co. 243
Spence Engineering Co. 372
Spencer, James 226, 255, 394
Spencer Lens Company 221, 244
Sperry Gyroscope Co. 317
Sperry Products, Inc. 319
Sprague Products Co. 36, 56
Sprague Specialties Co. 250
Sproull, Wayne T. 11
Standard Gage Co. 57, 62
Stanton, C. I. 272
Stets Company 372
Stokes Machine Co., F. J. 112
Street, C. C. 6
Stromberg Electric Co. 168
Sunerior Electric Co. 322
Swisher, L. N. 294

T

Taber Instrument Co. 64
Tagliabue Mfg. Co., C. J. 87, 170, 198, 245, 374, 388
Taylor Instrument Cos. 111, 174, 376
Teach, Edwin E. 16
Televiso Products, Inc. 84, 194, 316
Thwing-Albert Instrument Co. 386
Tobias, William 12
Tork Clock Co., Inc. 176
Trindett Electrical Inst. Co. 110
Triumph Manufacturing Co. 108
Turner Company, The 200

U

Ulanet Co., George 27, 108
United Cinephone Corp. 108, 178, 378
United Transformer Corp. 59, 243, 386

V

Vultee Aircraft Co. 309

W

Wadsworth Electric Mfg. Co. 178
Walser Automatic Timer Co. 178
Ward Leonard Electric Co. 180, 317
Warren Telechron Co. 180
Warrick Co., C. F. 378
Water Level Controls Co. 27, 379
Watson, James L. 101
Weltronic Corporation 31, 85, 180
Westinghouse Electric & Mfg. Co. 84, 117, 182, 198, 202, 383, 387, 389
Wheelco Instruments Co. 184, 380
Whitmore, John M. 280
Wilgus Mfg. Co. 380

Z

Zand, S. J. 294
Zenith Electric Co. 184

BOOK REVIEWS—SUBJECT INDEX

"Aeroplane Instruments"—Parts I & II 188
Aircraft Instruments, Their Theory, Function and Use 324
"Cathode-Ray Oscillographs" 44
Chambers's Technical Dictionary 82
"Cumulative Index"—Journal of the Acoustical Society of America, Vols. 1-10 46
"Electrical Contacts" 188
Electromagnetic Devices 324
Flash! Seeing the Unseen by Ultra-high-speed Photography 104
"French-English Science Dictionary"—1st Edition 189
"Geophysical Exploration" 44
Instrument Flying 324
"Meteorology" 188
"Molecular Spectra & Molecular Structure—I. Diatomic Molecules" 189
"Reports on Progress in Physics" 44
Reports on Progress in Physics 80
"Temperature—Its Measurement and Control in Science and Industry" 44
Temperature Measurement 78
"Theoretical Physics—Vol. III—Relativity and Quantum Dynamics" 216
"Time and Its Reckoning" 216

BOOK REVIEWS—AUTHOR INDEX

American Institute of Physics—1939 Temperature Symposium 44
Awbery, J. H. 80
DeVries, Louis 189
Edgerton, Harold E. 104
Ferguson, Allan 44
Firestone, F. A. 46
Green, Noel D. 216
Heiland, C. A. 44
Herzberg, Gerhard 189
Hughes, L. E. C. 82
Killian, Jr., James R. 104
Molloy, E. 188
Patton, Orion Edward 324
Piston, Donald S. 188
Reyner, J. H. 44
Roters, Herbert C. 324
Tweney, C. F. 82
Way, R. Barnard 216
Weber, Robert L. 78
Weems, P. V. R. 324
Wilson, W. 216
Windred, G. 188
Zweng, Charles A. 324

CLEARANCE SALE

The Engine Indicator—Its Design, Theory and Special Applications. By K. J. De Juhasz. 1934. A mine of information for all engineers who have to investigate forces and motions—not only in engines but in many other applications. Cloth, 5½x8¼ inches, 343 pages, $3.75.

(Only 141 copies left) **Special price $2.00**

Dielectric Phenomena in High Voltage Cables. By D. M. Robinson, 1936. Cloth 5½x8½ inches, 186 pages, $5.00.

(Only 25 copies left) **Special price $3.00**

A Symposium on Illumination. Edited by C. J. W. Grieveson. 1935. Made up of a number of chapters, each written by a specialist. Theoretical and practical problems connected with modern lighting. Cloth, 5½x8¾ inches, 229 pages, $5.00.

(Only 11 copies left) **Special price $3.00**

Automatic Protection of A. C. Circuits. By G. W. Stubbings. 1935. The material is logically presented in lucid manner. It is a concise treatment of a subject heretofore requiring extensive reading in diverse publications. Cloth, 5½x8¾ inches, 293 pages, $5.00.

(Only 23 copies left) **Special price $3.00**

Mercury Arc Rectifier Practice. By F. C. Orchard. 1936. This book is one there need be no hesitation in recommending to anyone concerned with the practical operation of rectifier plants. Cloth, 5½x8½ inches, 235 pages, $5.00.

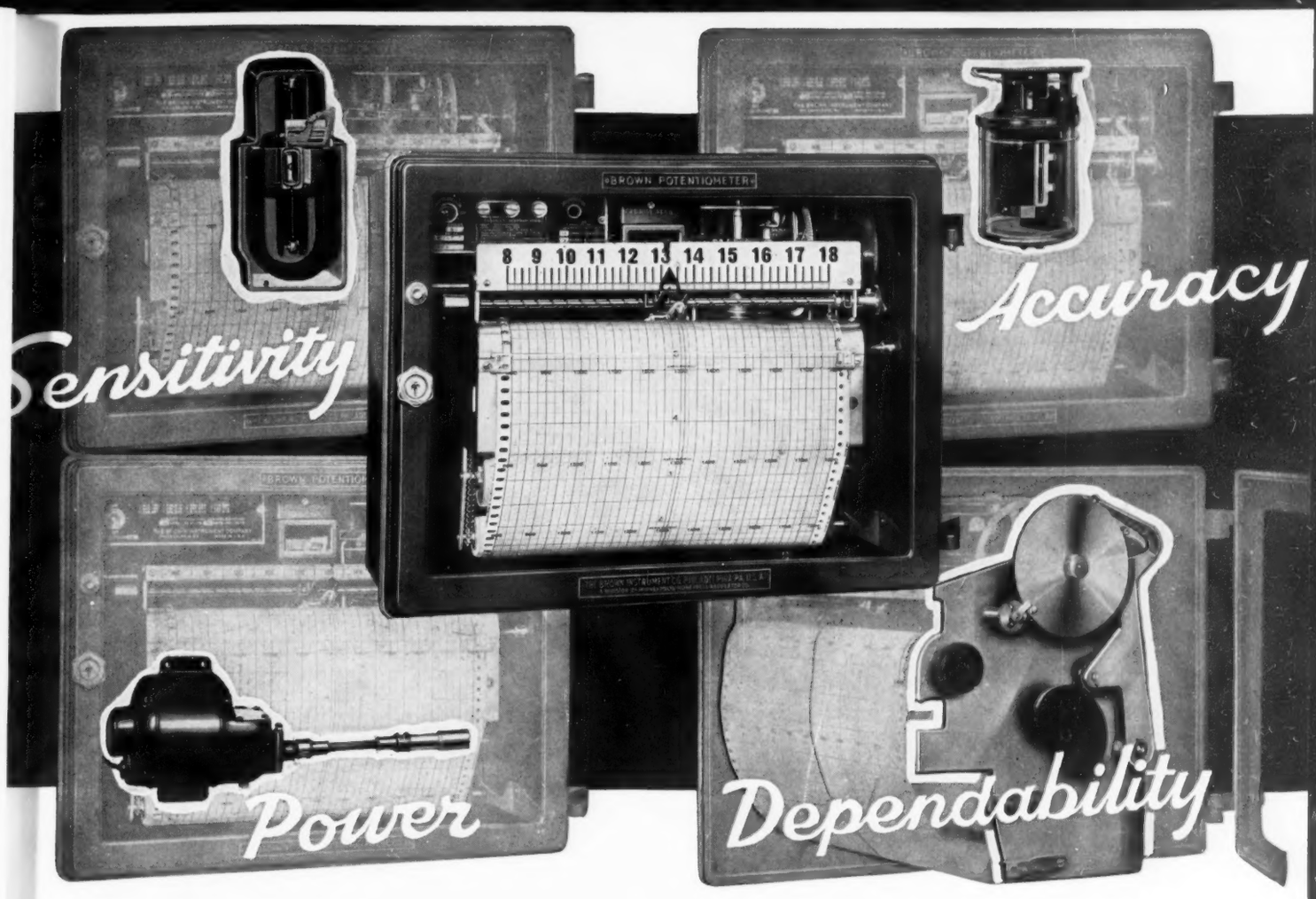
(Only 159 copies left) **Special price $3.00**

Theory of Alternating Current Wave Forms. By Phillip Kemp. 1935. Probably the first treatment including adequate discussions on non-sinusoidal wave forms. A standard reference. Cloth. 5½x8¾ inches, 218 pages, $4.50.

(Only 54 copies left) **Special price $3.00**

Prices include postage to U. S.

INSTRUMENTS PUBLISHING CO.
1133 Wolfendale Street
PITTSBURGH, PA.



UNIT CONSTRUCTION *Permits*

QUICK DELIVERY

Brown Potentiometer Pyrometers are rugged, precision-built instruments and guaranteed to give the performance required for industrial service today or tomorrow.

Like a fine automobile, the working parts of these instruments are assembled into major units.

Because of our expanded facilities and modern manufacturing methods, an ample supply of Brown Potentiometer Pyrometer Units is now in stock—ready to be calibrated and assembled to meet your specific requirements.

The mighty industrial defense program is geared to run at a tremendous pace. SPEED UP! SPEED UP! is today's demand in the Metal Working Industry.

It is our desire to assist you in every way possible to speed up production. Write, phone or wire our nearest branch. Tell us your need. . . . We'll follow through if you need charts, ink, marking ribbons, thermocouples, protecting tubes, and extension lead wire . . . in fact, every standard item you need can be shipped immediately.

Leading metallurgists who demand prompt delivery, extreme precision and reliable measurement and temperature control of all types of electric, gas, or oil-heated units specify Brown Potentiometer Pyrometers to improve quality, reduce costs.

THE BROWN INSTRUMENT COMPANY, *a division of Minneapolis-Honeywell Regulator Co.*, 4482 Wayne Avenue, Philadelphia, Pa. Offices in all principal cities. Toronto, Canada: 117 Peter Street — Amsterdam-C, Holland: Wijdesteeg 4 — England: Wadsworth Road, Perivale, Middlesex—Stockholm, Sweden: Nybrokajen 7.

RAPID REPAIR SERVICE

If an accident damages a Brown Potentiometer Pyrometer, it can be returned to service promptly. A Brown factory-trained service engineer will bring new parts and make repairs in your plant.

Get the facts about Brown Periodic Service. Discover how little it costs you to have your instrument investment protected by a nation-wide organization of factory-trained service engineers who already supply Brown Periodic Service to more than 2,000 industrial plants.

BROWN POTENTIOMETER PYROMETERS

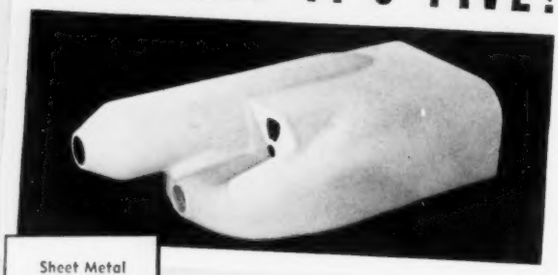
AND

MINNEAPOLIS · HONEYWELL CONTROL SYSTEMS

To Measure and Control is to Economize

★★★★★ LEWYT NEWS ★★★★★

LOOKS LIKE ONE PIECE... ACTUALLY IT'S FIVE!



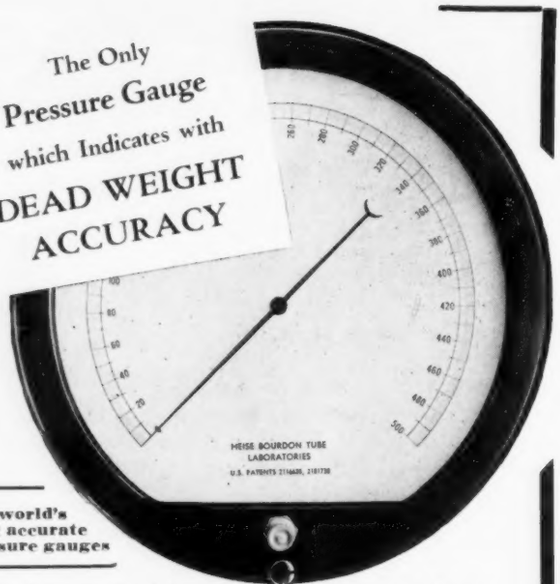
Sheet Metal Fabrications
Stamping
Machine Work
Electrical Assembly
Wiring and Testing
Welding
Paint Finishing
Products Completely Manufactured

This Aircraft Instrument Housing was fabricated of five formed sheet aluminum pieces welded together. Limits ±.005". Tooling $385. Initial order 300 units. Originally planned for deep drawing our method of manufacture effected savings of $6800 in dies alone, with extreme precision maintained throughout. This is the character of work we do for many well known companies, and, what we are equipped and organized to do for you too. Let us quote on your specifications.

50 YEARS' EXPERIENCE

LEWYT METAL PRODUCTS CO. Inc.
60 Broadway Brooklyn, N. Y.

The Only Pressure Gauge which Indicates with DEAD WEIGHT ACCURACY



The world's most accurate pressure gauges

Heise Extreme Precision Gauges provide the quickest *reliable* way of testing: (1) for faster results where dead weight testers have been used, (2) inspectors' gauges, (3) new ordinary gauges. Indispensable to manufacturers of equipment which includes gauges. *Important feature:* revolving dial simplifies calculations by eliminating tare figure. Zero setting is instantaneous from front of bezel and self locking.

Note. Prices are surprisingly low. Example, $120 for a ten-inch (11¾" O.D.) gauge with 500 graduations.

HEISE Bourdon Tube Laboratories
275 NOBLE AVE. BRIDGEPORT, CONN.
In Collaboration with The A. H. Emery Co.

Instruments
THE MAGAZINE OF
Measurement and Control

Vol. 14 JANUARY 1941 No. 1

SPECIAL ISSUE—IN TWO PARTS

(Part Two, bound separately, is *The 1941 Instruments Index*)

CONTENTS OF PART ONE

Special Features

ARTICLES WINNING PRIZES IN THIRD ANNUAL INSTRUMENTATION CONTEST. THEME: "SPEEDING UP NATIONAL DEFENSE THROUGH INSTRUMENTATION."

Report of Jury of Award 2

FIRST-PRIZE ARTICLE
(Steel Annealing Control) ..... V. C. DUPEN 3

SECOND-PRIZE ARTICLE
(Measuring Bores) ..... C. C. STREET 6

THIRD-PRIZE ARTICLE
(Measuring Case Depth) ..... FRANK DEDEK 8

FOURTH-PRIZE ARTICLES
(Tungsten Production) ..... W. H. SAYLER 10
(Electrical Averaging) ..... W. T. SPROULL 11
(Inspecting Bores) ..... WILLIAM TOBIAS 12
(Train Safety) ..... A. E. F. BILLSTEIN 12

FIFTH-PRIZE ARTICLES
(Dynamic Unbalance) ..... C. M. SHERER 14
(Automatic pH Control) ..... C. E. DIEHL 15
(Safety Interlocks) ..... E. E. TEACH 16
(Measuring Case Depth) ..... D. F. CLIFTON 18
(Pipe-line Speed-up) ..... S. H. ISAACS 22

Regular Features

EDITORIAL COMMENT 1
NEW INSTRUMENTS 26
MANUFACTURERS' NEW LITERATURE (Pages 75-76 of Part Two)
ADVERTISERS' INDEX 28

Published Monthly on the 15th by
THE INSTRUMENTS PUBLISHING COMPANY
1117 Wolfendale Street, Pittsburgh, Pa.

RICHARD RIMBACH, Managing Editor — **M. F. BEHAR**, Editor

BRANCH OFFICES
Boston: James Condon, 36 Myrtle St. (Lafayette 0829).
New York: R. K. Farnham, 56 W. 45th St. Room 1105 (Murray Hill 2-8763)
Chicago: William Farnham, 201 N. Wells St. (Andover 4180).
Cincinnati: Harold W. Haskett, Keith Bldg. (Parkway 7639).

Annual Subscription: U. S. $2.00. All other countries $3.00 *payable in advance* (remit by New York draft). Copyright 1941 by The Instruments Publishing Company. Entered as second-class matter January 26, 1932, at the post office at Pittsburgh under the Act of March 3, 1879.

PRECISION APPARATUS

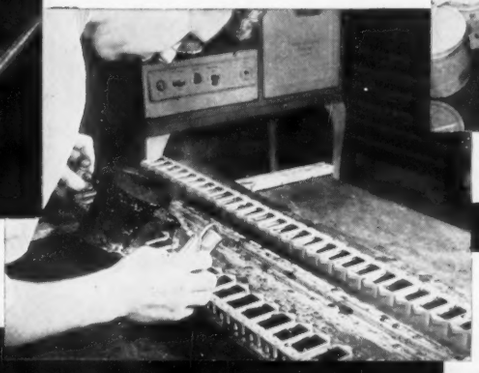
After assembly the units are aged for three heat cycles and placed in a desiccator between cycles; they are then calibrated and aged again for three cycles.

Assembly in the Bakelite case is composed of a bottom layer of silica gel, a blotting paper pad, the condenser unit, and ground cork.

A precision mica condenser in the making: low-loss bakelite case, heavy brass end-plates; heavy spring pressure-plate; selected India mica; tin foil; blotting paper; silica gel; ground cork; Ozite sealing compound; leads; assembly screws.

During assembly all parts of the condenser are maintained at 300 degrees F to drive out all moisture; the workman has a glass shield between his face and the condenser parts to hold the heat from the electric hot-plate upon which the condensers are assembled.

(above) The condensers are then sealed in a special Ozite compound mixed to give the proper relation between adhesion and melting point.



(at left) After the compound has cooled a final layer is poured on and sealed to the sides of the case with an alcohol torch. The condensers then are tested for breakdown at 2,500 volts d.c. In the calibration laboratory, they are finally checked for capacity, power factor and d-c leakage.

SEVERAL years ago General Radio assigned an engineer to investigate the design of small fixed condensers having sufficient stability and low losses for use in precision circuits such as beat-frequency oscillators, bridges and standard-signal generators.

After a number of months of research, the Type 505 and Type 509 Condensers were developed. While designed primarily for use in G–R instruments, hundreds of these condensers have been sold separately for precision circuits and apparatus.

In the Type 505 and 509 Condensers selected India mica is used, each piece being carefully inspected for scratches and other mechanical defects which cause high dielectric losses. Mica, despite its excellent dielectric properties, is fairly high in its moisture absorption characteristics, a property which adversely affects its power factor. In these condensers the mica and its associated tin foil are kept at a temperature of 300 degrees F for a considerable time before the condensers are assembled, during assembly, and thereafter until sealed.

To keep the condensers dry after assembly, they are placed in a bakelite case with a mixture of silica gel and ground cork and are then sealed with an Ozite compound. The amount of desiccant sealed in is such that there can be 2,000 complete changes of air due to leakage before the desiccant will be used up.

Changes in pressure can cause appreciable changes in capacitance. In these condensers the stack is heavily loaded with a stiff spring under considerable tension to a point where the change in capacitance with pressure is very small. During the assembly process, each unit is carefully aged through a number of heat cycles to increase stability.

The resulting characteristics are such that these condensers make admirable secondary standards of capacitance and are of such physical form that they are readily adapted to use in precision measuring instruments. All Type 505 units are adjusted within 1% or 10 $\mu\mu$f whichever is larger and Type 509 units within ¼%; the temperature coefficient of capacitance is less than +0.01% per degree C between 10 degrees and 50 degrees; the power factor of almost all of the units at 1,000 cycles and 25 degrees C is less than 0.05%; the leakage resistance in most of the units is greater than 100,000 megohms. These condensers are available in standard capacitances from 100 $\mu\mu$f to 1 μf at prices between $3.50 and $48.00. GENERAL RADIO COMPANY, Cambridge, Massachusetts. Branches in New York and Los Angeles.

Since 1915 Manufacturers of Precision Electrical Laboratory Apparatus

Tiny changes in temperature, so small that you can see them on the chart only with a magnifying glass, are more than large enough to start Micromax control action. And correction of the change starts when recording starts . . . doesn't wait till a change is recorded. That's one reason for extreme steadiness of heat under Micromax Control.

You Would Need A Glass

To See What A Micromax Pyrometer "Sees"

Suppose you were regulating the heat to a furnace, by hand, using a Micromax Pyrometer's record as a guide.

Every time, then, that Micromax showed you a change in temperature, you'd turn the valve or damper. After a little practice, you'd keep the temperature quite uniform.

But, unless you held a reading-glass to the record, you couldn't keep the same uniformity that a Micromax Pyrometer keeps when it automatically operates its own valve-drive. For without the glass, you couldn't see changes as soon as the instrument "sees" them. And you couldn't respond as quickly and accurately as the instrument responds.

The reason is summed up in the "micro-responsive" balancing unit of Micromax. This vital unit, the unique product of a quarter-century of development, responds *early* to each tiny deflection of the instrument's temperature-driven pointer. It allows no clearance—no space through which the pointer can move before its motion causes corresponding motion of the valve. The effect is as responsive as though the pointer acted snugly and directly on the valve. Temperature changes are headed off with a smooth efficiency that sets new standards for automatic control.

See Catalog N-00A for models and other information.

Broaching Tools Get Precise Heat-Treatment When 3 Rayotubes "Gang Up"

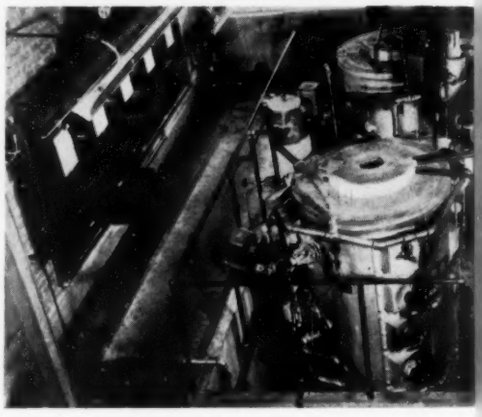
When a broaching tool is nearly 7 feet long and only 6 inches thick, and is made of high-speed steel, here's the way Lapointe Machine Tool Company controls heat-treating temperature to secure uniformity in spite of the tool's sylph-like figure.

The broach, suspended by one end, is preheated in a 12-inch-by-84-inch Stewart vertical muffle furnace. After preheating, it is transferred to a similar "superheater" furnace, for the higher heating which hardens high-speed steel.

Both these furnaces burn vaporized fuel oil, regulated by Micromax control pyrometers which act through Micromax electric valve drives. The difference between the two control systems is in their temperature-detectors; the preheat furnace uses three thermocouples, while the superheat unit uses three Rayotubes.

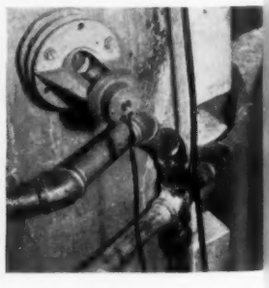
Rayotubes are our comparatively new radiation-type detectors. They are far more responsive and longer-lived than couples, at temperatures above 2000 F, and they thus enable Lapointe to secure advanced, dependable control at the higher temperatures, where, of course, the critical heating is done.

Located at top, center and bottom of the furnace, each Rayotube "reports" to a Micromax pyrometer, which opens or closes four valves as may be necessary to hold the long, thin broach at temperature. So complete, agile and entirely automatic is this control that heating is not only highly uniform but is reasonably rapid . . . an especial advantage at present.



Above—Lapointe Mach. Tool Co.'s heat-treat for speed broaches.

Below—One of the Micromax Pyrometers, and its tube, in the Lapointe heat-treat.



Controls of the same types are being applied to other industrial furnaces . . . batch type and continuous. Write for Catalog N-00A, which describes the various Micromax models.

LEEDS & NORTHRUP COMPANY, 4955 STENTON AVE., PHILA., PA.

LEEDS & NORTHRUP

MEASURING INSTRUMENTS · TELEMETERS · AUTOMATIC CONTROLS · HEAT-TREATING FURNACES

Jrl Ad ENT-0600C(11)

Instruments THE MAGAZINE OF Measurement and Control

M. F. BEHAR, Editor

Defense WILL Be Speeded Up

IN mellow years of peace, when no cloud threatens national security, all kinds of inventions and schemes can be considered: an evidently half-formed plan may evolve into a major strategic advantage in the more or less distant future.

But in times of dire emergency it is the present that counts: the most valuable ideas are those which are immediately applicable. With the specific intention of bringing to light a number of such ideas, *Instruments* announced last July that the theme of the Third (1940) Annual Instrumentation Contest would be "Speeding Up National Defense Through Instrumentation." On this page last July, the initial announcement was in the form of an explanatory editorial entitled "Ten Million Man-years"—referring to the production task facing American industry.

That was six months ago. Today, the seventeen billion dollar preparedness budget can be translated into fourteen million man-years. Since the number of men actually engaged is far from fourteen millions, since production involves innumerable sequences from raw materials to finished products, and since a number of facilities where men are to be employed on defense production are yet unbuilt, it would seem that instead of fourteen million men working during one year and finishing the job in early 1942, it will be a case of an average of six million men working for more than two years and completing most of the job toward the middle of 1943. When we declared on this page that the answer is "Speed, Speed and more Speed," we were still thinking of ten million man-years, not fourteen. The need for instrumentation—especially *automatization*—has grown even keener!

Perhaps the best thing about the words "through instrumentation" in the theme of the contest is that they limited the ideas to those which are immediately applicable. Instruments, meters, automatic control systems, automatic inspection set-ups, etc.—these are not factories to be built, wells to be drilled, mines to be dug: they are readily-available products. Even an entirely new "instrument" or "automatic system" is in most cases made up of readily-available components.

On the whole, therefore, *Instruments* may pride itself upon this special issue containing practical ideas. The credit, of course, should go to the contestants themselves. Their ideas are ready for immediate adoption by numerous establishments engaged in defense production. In one respect, however, *Instruments* may claim a little credit. The preceding contests had been open only to instruments users; employees of instrument manufacturers were excluded because the prize money had been donated by instrument firms. This third contest was open to "all persons except employees of the Instruments Publishing Company or their relatives," because the $500 prize money was donated by this company. Result: Some excellent ideas submitted by employees of instrument manufacturers.

The thanks of American industry should be extended also to Captain Hanson, Lt.-Col. Guion and Messrs. Pigott and Rieger who patriotically donated their services as Jurymen.

The contest is over only in an official sense. It is just beginning to operate now, with the publication of this special issue. The aim was not so much to reward men with valuable ideas—it was to have these valuable ideas presented in such a way that they will be adopted. The rest is up to the readers* of this special issue. *Instruments* and the Jury of Award can call it a day; but the adoption of the ideas is in the hands of American industry. These are competent hands. Defense WILL be speeded up.

* * *

On the next page there is an official report of the Jury of Award. To this impersonal report your editor desires to add a postscript. I was disappointed in not seeing, among the entries, any description of an inspection or gaging "robot"—because automatized inspection has been a particular concern of mine for eight or nine years in connection with my Army assignment. I know from personal experience that there are thousands of human inspectors in the employ of the Army, Navy and private industry, who could be released from their repetitive drudgery—and should be! Without speaking for the Jury of Award or for *Instruments*, I state it as my own opinion that the **MOST** valuable ideas for speeding up production of Army and Navy ordnance matériel are summed up in two words: "automatized inspection." If you don't agree at first, look up and study the special feature article, "Inspecting Parts at Ford Plant," in the July 1936 *Instruments*.—MFB

*Including Defense officials not regular subscribers, to whom copies will have been mailed.

PLENARY SESSION OF THE JURY OF AWARD, THIRD ANNUAL INSTRUMENTATION CONTEST, NOVEMBER 25, 1940

RALPH T. HANSON	R. J. S. PIGOTT	M. F. BEHAR	EARL C. RIEGER	JAMES L. GUION
Captain, U. S. Navy	Pres. Am. Society for	Major Ord. Res.	Pres. Chicago Soc. for	Lt.-Col., U. S. Army
Navy Department	Measurement & Control	Ed. *Instruments*	Measurement & Control	War Department

Report on Third Annual Instrumentation Contest

Sponsored by The Instruments Publishing Company. Theme, "Speeding Up National Defense through Instrumentation"

IN compliance with the Announcement and Contest Rules promulgated in August 1940 (and amended in October 1940 with regard to the closing date) the Jury of Award met on Monday, November 25, 1940 in the office of the Pittsburgh Ordnance District, War Department — by courtesy of Lt.-Col. Guion, District Executive Officer. All members were present.

Representing Mr. Richard Rimbach, Conductor of the Contest (who was out-of-town) Mr. William Scoltock of the Instruments Publishing Co. delivered to the Jury all entries received at the office of the Conductor up to the official closing date (Nov. 23). All had been uniformly bound in 9x12 folders, each folder bearing only the number of the entry. These were as follows:

1196	2384	8218	10759	23514
1453	2421	8502	10768	23916
2028	2443	9039	15126	23930
2204	4381	9061	15629	23943
2363	4491	9205	19040	23966
2364	7902	9206	19065	28056
				30161

Mr. Scoltock also delivered to the Jury another package, containing the thirty-one sealed envelopes, each numbered and enclosing the name and address of the contestant. He also delivered "individual score sheet" blank forms prepared by the Instruments Publishing Co. for the convenience of the Jurymen.

First business was discussion of methods of grading: Rules of previous Contests had specified percentage points for "pertinency," "originality," etc., but this time the Jury was not thus bound.

Captain Hanson proposed a method of assigning relative and tentative grades in the course of the first reading. Adopted.

Col. Guion suggested keeping records of all grades assigned. Adopted.

Mr. Pigott proposed a totalizing method for classifying entries as the work goes on. Adopted.

Various paragraphs of the Contest Rules were studied closely. Result of discussion was unanimity of interpretations.

Mr. Rimbach, Contest Conductor, telephoned from out-of-town, expressing his regret that other duties kept him away. He was assured that all Jurymen were in perfect agreement on the Contest Rules.

The first phase of the judging consisted in all entries being read, roughly graded, and initialed, by all Jurymen. At the conclusion of this work, all folders were examined to verify that each bore five initials. Then a preliminary check of the tentative grades was made. Result, twenty-two entries selected for the "Semi-finals," and nine put aside. All of these twenty-two entries were passed around again, so that each Juryman might revise his original tentative gradings of the first few entries he had read, in the light of his having read all thirty-one.

Tentative totals were compiled. The sixteen entries which had been given relatively high ratings by at least one Juryman were kept, as "in the running."

The sixteen "in the running" were given their final readings and their final *ratings* on the Jurymen's "individual score sheets."

When this work was completed, the mathematics of determining final standings was discussed, because different well-known systems give different final standings in cases of near-ties. The method finally adopted was somewhat as follows:

Since the prize money donated by the Instruments Publishing Co. is $500

to be divided as follows:

First Prize	$200
Second Prize	$100
Third Prize	$ 50
Four Fourth Prizes of	$ 25
Five Fifth Prizes of	$ 10,

and since there are five Jurymen, each Juryman has one hundred "dollars" to distribute—forty "dollars" to his choice for First, twenty "dollars" to his choice for Second, ten "dollars" to his choice for Third, five "dollars" to *each* of his four choices for Fourth, and two "dollars" to *each* of his five choices for Fifth.

There being no adding machine in the room, Mr. Pigott volunteered as "lightning calculator" and was given a rousing vote of thanks.

Final Standings

First Prize: No. 4491 (145 "dollars")

Second Prize: No. 10759 (102 "dollars")

Third Prize: No. 2204 (39 "dollars")

Fourth Prizes (listed here in *numerical* order): 10768, 19040, 19065, 23966.

Fifth Prizes (in *numerical* order): 2443, 4381, 9039, 9205, 15629.

Honorable Mentions—the remaining ten in the twenty-two "semi-finals" (in *numerical* order): 1196, 1453, 2028, 2363, 2364, 7902, 8502, 9039, 15126, 23916.

In the opinion of the U. S. Army and U. S. Navy representatives, the twelve prize-winning entries and the ten Honorable Mentions could all be published without risk of divulging secret National Defense information. [*Note*—The twelve prize-winning entries are all published in this issue of *Instruments;* others receiving good grades may be printed later.]

Major Béhar was instructed to gather all individual score sheets and other "mathematical" sheets, have them checked, prepare the official report of the Jury, notify the Conductor of the Contest, and wind up remaining details.

Upon opening the sealed envelopes it was found that [as in the two previous Contests] entries had been received from a wide diversity of industries and of geographical locations.

R. T. HANSON
J. L. GUION
R. J. S. PIGOTT
E. C. RIEGER
M. F. BEHAR

Mr. Dupen was born in 1904 in Cornwall. He is a descendant of Richard Trevithick, famed as the inventor of the Cornish boiler and as the builder of the first locomotives for passenger service. Mr. Dupen was educated at Weymouth College and took both civil and mechanical engineering at the City and Guild of London Technical College. After working for the Gnome and leRhône Engine Co. he went to India in 1925 where he first did civil engineering contracting and later was in charge of automobile assembly and commercial body building for the South Indian distributors of General Motors products. He joined Bristol's Ltd. in 1935. Author of Institute of Fuels paper on industrial temperature instrumentation.

Fortunately for this write-up, George Gaites, now Pittsburgh District Manager of the Bristol Co., was with Bristol's Ltd. in England in 1935 and '36. Mr. Gaites helped us expand a brief cablegram into the preceding paragraph and added that Mr. Dupen became sales engineer for the English Bristol Co. in August 1935 and Sales Manager in January 1936 (when Mr. Gaites himself became Managing Director).

As we go to press, the portrait of Mr. Dupen, for which we had written by air mail in November, has not yet been received but—again fortunately—Mr. Gaites happened to have a Dupen family group snapshot, a portion of which has been enlarged to make the accompanying portrait.

Increasing by 80% the Output of Steel Annealing Furnaces

Awarded the $200 First Prize in the Third Annual Instrumentation Contest

By V. C. DUPEN

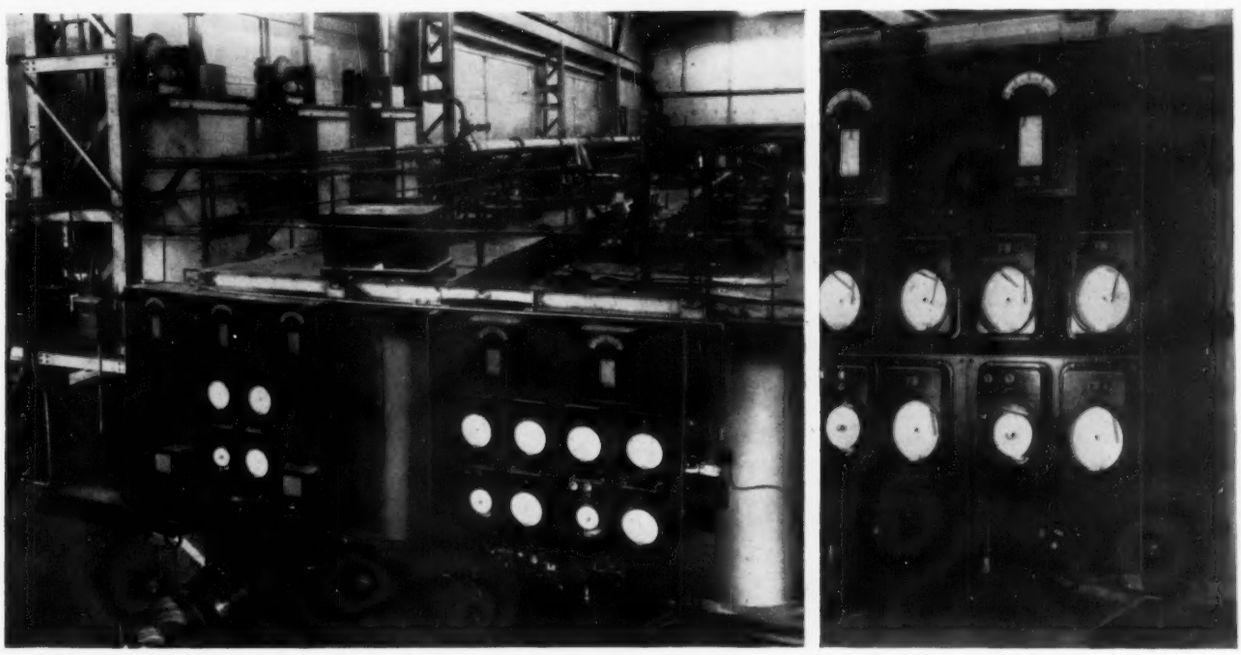
Sales Manager, Bristol's Instruments Co. Ltd., West Twyford, England

HEAVY demand for increased production and greater uniformity of product of bright annealed steel strip and wire led to an examination of the control problems surrounding the annealing furnaces used by Guest, Keen & Nettlefolds of Cardiff, S. Wales. The furnaces concerned were of the Grunewald type to the design of the Morgan Construction Co.; they consisted of two cells, each containing a charge supported by heat-resisting metal straps and enclosed in a sealed heat-resisting pot, one cell being used for preheating a charge and the other for bringing a charge to annealing temperature.

The firing of the furnace was accomplished by cold blast-furnace gas and recuperator heated air, having burners placed in a muffle around the annealing cell with the products of combustion led around the preheating cell to the stack.

The object in view was to raise the charge in the annealing cell to annealing temperature in the shortest practicable time and, simultaneously, to bring to as high a temperature as possible the charge in the preheating cell, consistent with keeping within safe limits of the furnace and the heat-resisting straps supporting the load.

The control of these furnaces was previously accomplished by means of an on-and-off potentiometer controller. By reason of this on-and-off operating characteristic, the flame length was constantly varying, making the heat in-



Left—General view of three two-cell furnaces and three sets of co-ordinated instruments. *Right*—Close-up of instrument panel. Note that for each furnace there are two potentiometer recorder-controllers, a program recorder-controller (twin-instrument), a cycle controller (bottom) and a recording flowmeter (top).

LEGEND OF OPERATIONS*

The cycle required for *program control cam No. 1* is as follows:—

Lower temperature from 880°C. to 780°C. in 56 min. with a sharp drop at the end of the fall of not more than 20°C. (less if possible), to give a positive operation of the Burgess switch being operated by cam follower; rise immediately from 780°C. to 880°C. in 2 min. Hold at 880°C. for 2 min.; lower from 880°C. to 780°C. in 56 min., again with sharp drop at end of fall. Rise immediately to 880°C. in 2 min.; hold at 880°C. for 2 min. Total time 2 hours. (Summary: two 1-hr. periods.)

Program control cam No. 2:—

Lower temperature from 880°C. to 780°C. in 36 min., with sharp drop at end of fall. Rise immediately from 780°C. to 880°C. in 2 min. Hold at 880°C. for 2 min. Lower from 880°C. to 780°C. in 36 min., again with sharp drop at end of fall. Rise immediately from 780°C. to 880°C. in 2 min.; hold at 880°C. for 2 min. Lower from 880°C. to 780°C. in 36 min., again with sharp drop at end of fall. Rise immediately from 780°C. to 880°C. in 2 min. Total time 2 hours. (Summary: three 40-min. periods.)

Referring to the *Cycle Controller cam:*—

Cam follower will climb up the first slope and stop when *C1* is operated. When No. 1 Unitact Pyromaster closes the circuit, the cam will rotate and as the cam follower climbs the second slope, *C2* will be closed; *C2* remains closed until the cam follower drops down to the lowest position again. The time during which *C2* is closed requires to be varied between 2 min. & 4 min. and to be sent out with the segments set at 3 min. When the cam follower has dropped to the lowest point, both *C1* and *C2* are operated, so stopping the Cycle Controller cam.

Referring to Sketch B, the sequence of operations will be as follows:—

Starting from the positions where the cam follower on the Program Controller is on the 880°C. point and the temperature in Pot No. 1 (Sketch E) is below 650°C., which is the control point of No. 1 Unitact Pyromaster:—

(1) The temperature in the furnace muffle will be controlled at 880°C. until the temperature in Pot No. 1 reaches 650°C. When this point is reached, No. 1 Unitact Pyromaster makes high contact, which gives a circuit through switch *B.P.* and the program control cam motor field *P*, rotating the cam, also a circuit through the Cycle Controller.

(2) Shortly after the cycle controller has commenced rotating, the cam follower climbs up the first slope, moving *C1* to the down position, thus breaking the cam motor field and stopping the cam rotating.

(3) Motor *P*, however, continues to rotate until the cam follower reaches the 780°C. point where the cam follower arm opens switch *B.P.*, thus stopping the cam motor *P*.

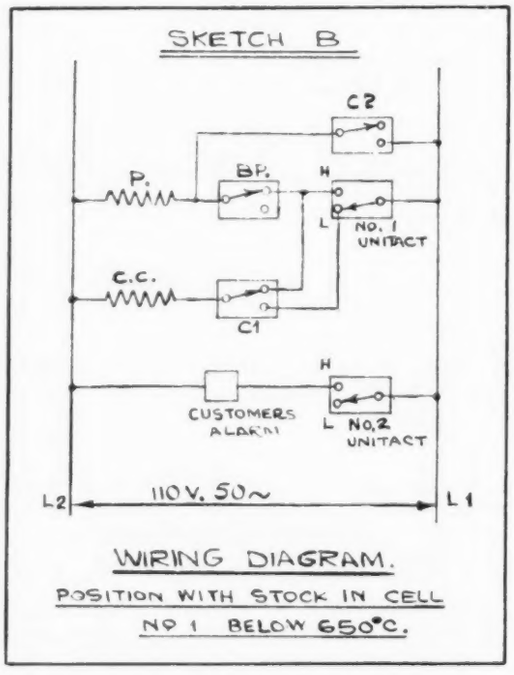
(4) The muffle temperature then continues to be controlled at 780°C. until Pot No. 1 reaches the annealing temperature. No. 1 Thermocouple is then withdrawn and the pot taken out and a fresh cold pot put in. The resultant cooling of No. 1 thermocouple causes No. 1 Unitact Pyromaster to make low contact. As *C1* is in the down position, this gives a circuit through the Cycle Controller motor, causing the cam to rotate.

(5) As the cam rotates, the cam follower climbs up the second slope, closing *C2*. This completes the circuit through the motor field *P* rotating the program control cam, causing the cam follower to rise up the cam from 780°C. to 880°C. in 2 min. and travel along the "hold" portion at 880°C. for 2 min.

(6) At the end of 3 min. the Cycle Controller cam follower drops down to the lowest point on the cam, breaking *C2*, thus stopping motor *P* and moving *C1* to the up position, stopping *C.C.* motor.

(7) The cycle is then repeated, starting from the point where the muffle is controlled at 880°C.

*Copied from a blueprint accompanying Mr. Dupen's typewritten manuscript. This blueprint, though undated, is obviously older than the manuscript written for the Contest. Moreover, it would seem that some modifications were made, such as cutting new cams, etc. Therefore, although we print this "Legend of Operations," we do not publish the sketches of the original cams.—EDITOR.



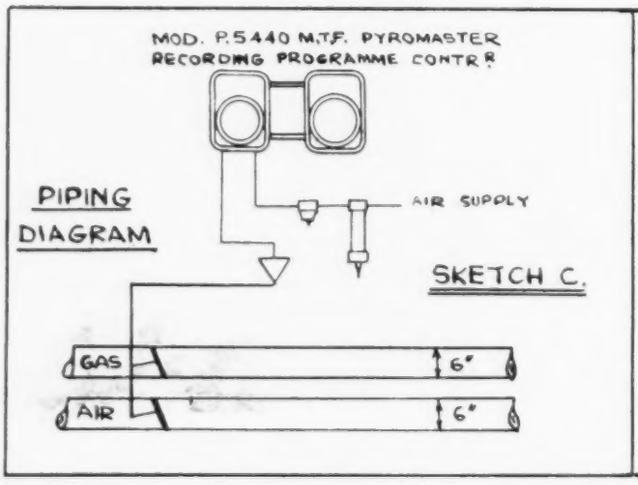
P.—Cam Motor of Program Controller.

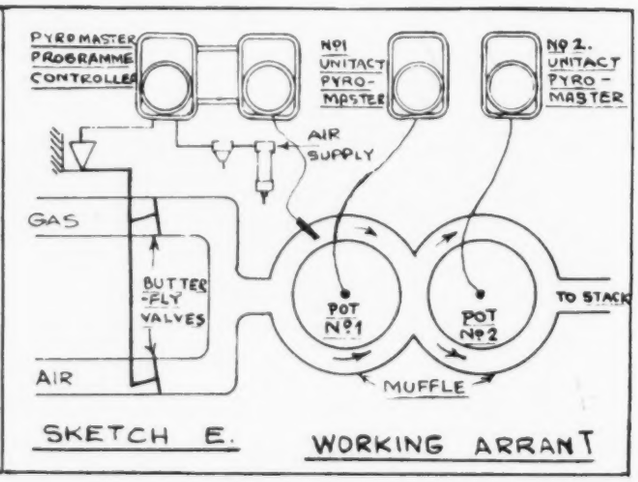
C.C.—Cam Motor of Cycle Controller.

BP.—Micro Switch operated by cam follower of Program Controller.

C1—No. 1 Double-throw Micro Switch on Cycle Controller.

C2—No. 2 Single-throw Micro Switch on Cycle Controller.

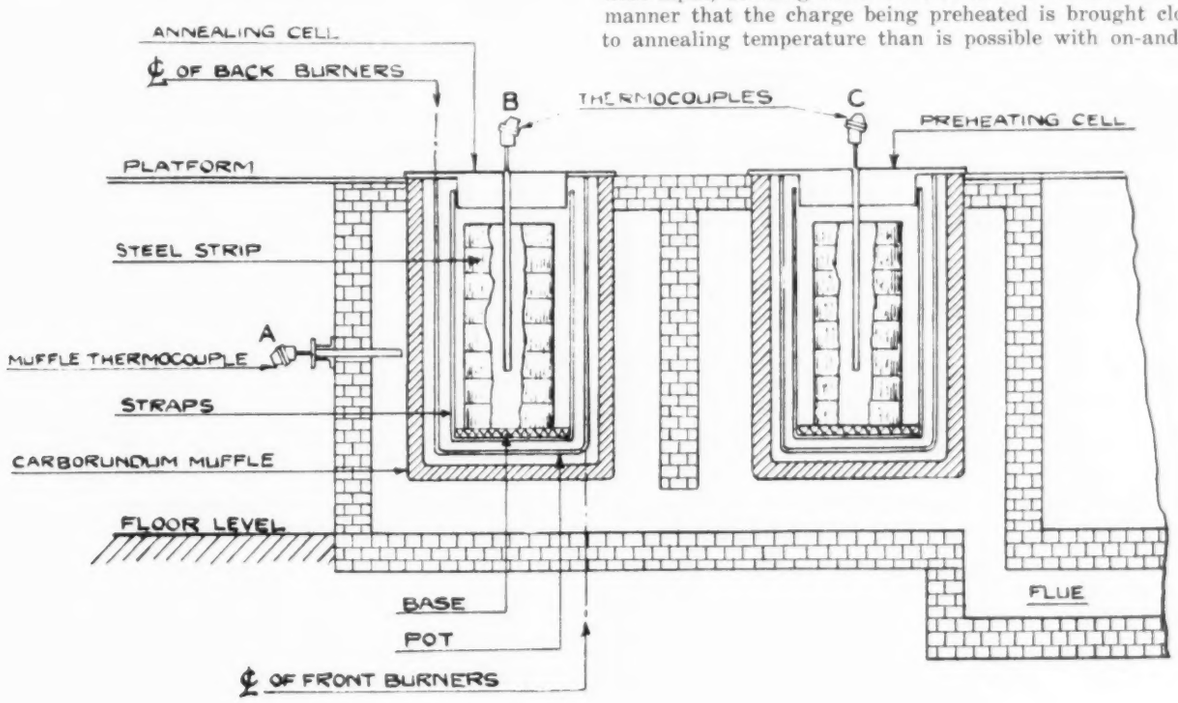




put to the preheating cell inconsistent, reducing the efficiency of preheating, imposing unnecessary temperature stresses on the refractories and thereby limiting output.

It was thought that with a proportional type controller, having a modulating valve operation, the flame length would be reasonably constant and a better output could be obtained. Further, by making the furnace instrumentation completely automatic, unnecessary manual adjustments by operators could be eliminated.

A coördinated control system was designed by Bristol's Instrument Co. Ltd., London, and consisted of a Bristol's Pyromaster Pneumatic Program Controller, two Unitact



DIAGRAMATIC ARRANGEMENT OF GRUNEWALD FURNACE.

Pyromaster Controllers and a Process Cycle Controller. These instruments worked in coördination with one another, the Pyromaster Program Controller to control the muffle temperature, the two Unitact Controllers as limiting controllers, recording charge temperatures and the Cycle Controller as a resetting instrument.

Referring to the drawings, it will be noted that the Pyromaster Program Controller controls the muffle temperature by modulating gas and air butterfly valves connected by suitable linkage to a pneumatic lever motor. This instrument controls the muffle temperature at about 860°C. until such time as the charge in No. 1 cell reaches a temperature of about 600°C. when high contact is made in No. 1 Unitact Controller, which sets in rotation the cam of the Pyromaster Program Controller.

The rotation of this cam progressively lowers the muffle temperature over a period of one hour to about 780°C. thus reducing the differential between the muffle and load temperatures, preventing the straps supporting the load from overheating, but still maintaining a higher heat input to the furnace than would be possible if the muffle temperature were lowered in steps.

When the Pyromaster Program Controller cam reaches 780°C., the cam stops and the muffle temperature is controlled at this point until the charge in No. 1 cell reaches annealing temperature when it is withdrawn and thermocouple *B* removed. The cooling of this couple causes No. 1 Unitact Controller to make a low contact, bringing into circuit the Cycle Controller which resets the cam of the Program Controller and raises the muffle control point to 860°C., ready for heating the preheated load in No. 2 cell, which is now placed in No. 1 cell, a fresh preheating charge being placed in No. 2 cell.

The object of No. 2 Unitact in the preheating cell is solely to safeguard the load; it has no control function but sounds an alarm if a light load in No. 2 cell reaches annealing temperature before a heavy load in No. 1 cell.

With a fully automatic control of this nature, it can be seen that the operator has no cause to interfere with the instruments; they function and reset themselves automatically, maintaining a consistently long flame with a high heat input, utilizing waste heat to the maximum in such a manner that the charge being preheated is brought closer to annealing temperature than is possible with on-and-off control methods. Additionally, by reducing the muffle temperature on a time-temperature basis, a high heat input is maintained to both charges without the possibility of endangering the load supporting straps or nonuniform heating of the steel.

The combination of a long and steady flame with minimum reduction of heat input when annealing temperature is being approached, together with a quick and automatic get-away when the charges are transferred, has resulted in a great increase in output, as shown by results in Table I which, in itself, is sufficient evidence of production speed up.

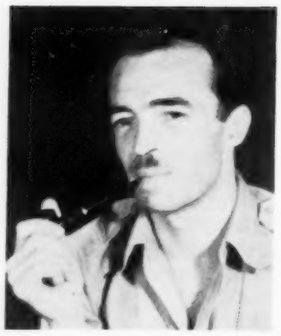
TABLE I.

After the six sets of Pyromaster Controls had been in use about eight months, definite advantages were credited to the instruments. Due mainly to the proportional type control, combustion atmosphere and flame length was kept consistent, so that a far greater heat input to the preheating cell was obtained, together with maximum heat input to the annealing cell. This resulted in the following production output increase on identical furnaces, but with the old on/off control and proportional control compared. The figures given are output per week taken at random between May and September, 1940.

	Week A		*Week B*		*Week C*	
	Tons	*Cwts*	*Tons*	*Cwts*	*Tons*	*Cwts*
On/off control.	61	11	54	1	59	11
Proportional control.	112	19	91	3	113	17
Increase.	83.2%		68.6%		90.7%	

AVERAGE: 81.5% increased output.

"Born in 1907 and, like many other kids in 1917-18, fooled around with radios of the crystal-detector loose-coupler type. By 1922 I had completed three years of mechanical drawing with good marks, flunking practically everything else in high-school—which I left for radio servicing. Went to Florida during the boom, worked on a surveying gang, in lunch wagons, piloted a plane, served as a life guard, etc. Back to New Jersey in 1925, drove a taxi, then worked for a radio set manufacturer. Went to sea; made three trips to South America, and one to California, where I worked in a store while studying for the Army Air Corps exams. Flunked. Hitchhiked back to the East; went to sea again: England, France, Bermuda and Venezuela—this last on a sailing ship. Then, in turn, seaman on a yacht, skipper of a 60-foot express cruiser, radio serviceman, toolmaker at ChrisCraft and then at Chrysler in Detroit.



"In 1929 I came East again and did some experimenting in my small basement shop where I repaired radio set and tube testers. Went to sea again, first as skipper of a small boat, then as seaman on the Grace Line to Venezuela. Left ship to take charge of small-tool equipment for a platinum and gold mine in the Columbian jungle, where malaria laid me low. Recovering, I worked my way back to the States. Did sound effects for the NCB, then machine maintenance for a radio-tube manufacturer, then to SKF as toolmaker working principally on dial indicators.

"From 1935 until late in 1940 Chief Engineer for the Federal Products Corp. where I did research on precision measuring instruments. Now with Sperry Gyroscope.

"Have contributed articles on measuring devices to *Product Engineering* and *The American Machinist*, and one on stroboscope circuits to *Electronics*."

The "Three-point Method" of Measuring Bores

Awarded the $100 Second Prize in the Third Annual Instrumentation Contest

By C. C. STREET

Chief Engineer, Federal Products Corp., Providence, R. I. (Now with the Sperry Corp., Long Island City, N. Y.)

WITH the increased precision of modern boring and honing machinery, there has arisen a need for accurate means of measurement. Devices and methods by the score have appeared on the market and almost all of these incorporate, as the basic principle, either one of two measuring principles. These are namely the "true diameter" and "three point" methods. The "true diameter" method gives an indication of the diameter accurately if certain aligning devices are incorporated in the gage. Fig. 1 shows this method schematically.

The fixed point B is called such because during any one group of measurements it remains fixed with respect to the frame of the gage. Centralizing points D and C are constrained to move rectilinearly and parallel to the plane produced by points A and B. This forms an isosceles triangle with points B, C and D at the vertices. If the gage

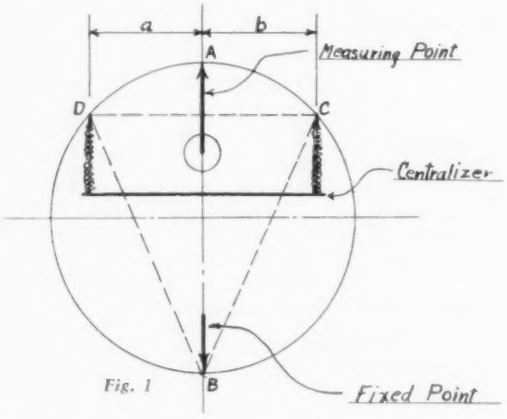


Fig. 1

is made with $a = b$ then the plane of $\overline{AB}$ will be on the diameter of the bore. The measuring point A can now make an accurate comparison of the bore being inspected. One of the problems of the design is that points C and D must exert a moderately high force so as to properly centralize the gage and the reaction of this force must be carried by point B. When a soft and highly polished material is being measured, point B is liable to seriously mark the bore. It also is at times difficult to design all of this equipment into the space allowed by small diameters.

Much of this can be overcome by using the "three-point" method. This principle is that of determining the change in the altitude of an isosceles triangle that can be contained in the bore under inspection. This is shown in Fig. 2.

Points B and C are usually made so that they can be adjusted to alter the nominal size of the gage within certain limits but remain fixed with respect to the gage body during the checking of any one bore size. The triangle formed by points A, B, and C is self-locating and requires no accessory equipment. The height of the triangle h will not change in direct proportion to the diameter but this difficulty may be overcome by proper design.

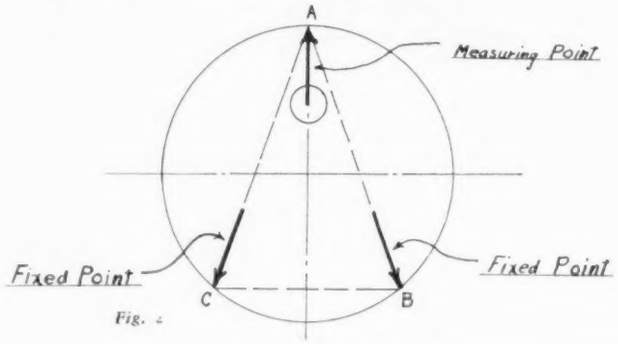


Fig. 2

Fig. 3

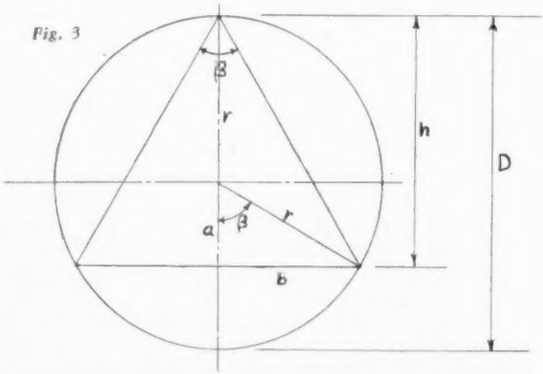


Fig. 3 shows the geometric design of the fixed and measuring points. The following discussion shows the manner in which such a gage can give the true difference in diameter between the master setting ring and the bore under inspection.

Let

$$h = r + a = r + \sqrt{r^2 - b^2} \qquad r = \frac{D}{2}$$

Sub for r,

$$h = \frac{D}{2} + \sqrt{\frac{D^2}{4} - b^2} \quad . \quad . \quad . \quad \text{(Eq. 1)}$$

Differentiating with respect to D

$$\frac{dh}{dD} = \frac{1}{2} + \frac{D}{2\sqrt{D^2 - 4b^2}} \quad . \quad . \quad . \quad \text{(Eq. 2)}$$

From Figure 1.

$$b = \frac{D \sin \beta}{2} \qquad b^2 = \frac{(D \sin \beta)^2}{4} \qquad 4b^2 = D^2 \sin^2 \beta$$

$$\frac{dh}{dD} = \frac{1}{2} + \frac{D}{2\sqrt{D^2 - D^2 \sin^2 \beta}} = \frac{1}{2} + \frac{1}{2\sqrt{1 - \sin^2 \beta}} = \frac{1}{2} + \frac{\sec \beta}{2}$$

$$\frac{dh}{dD} = \frac{1 + \sec \beta}{2} \quad . \quad . \quad . \quad . \quad . \quad \text{(Eq. 3)}$$

Equation 3 is only applicable when b is considered to vary with D. This condition is true when the gage is set for the nominal size. After adjustment is made b becomes a constant and must be treated as such. From equation 2 it can be seen that dh/dD will now vary with changes in D. The rate of change of dh/dD may be determined by taking the second derivative of equation 1.

$$\frac{d^2h}{dD^2} = \frac{2\sqrt{D^2 - 4b^2} - 2D \dfrac{2D}{2\sqrt{D^2 - 4b^2}}}{4\,(D^2 - 4b^2)} = -\frac{2b^2}{(D^2 - 4b^2)^{1.5}}$$

Sub for b:—

$$\frac{d^2h}{dD^2} = -\frac{(D^2 \sin^2 \beta)/2}{(D^2 - D^2 \sin^2 \beta)^{1.5}} = -\frac{\sin^2 \beta}{2D\,(1 - \sin^2 \beta)^{1.5}}$$

$$\frac{d^2h}{dD^2} = -D^{-1} \frac{\sin^2 \beta}{2(1 - \sin^2 \beta)^{1.5}} \quad . \quad . \quad \text{(Eq. 4)}$$

Over the range $\triangle D$, the range of the indicating device, d^2h/dD^2 may be considered as linear. The value of dh/dD for any point will be

$$\frac{dh}{dD} = \frac{1 + \sec \beta}{2} \pm \left[\left(-D^{-1} \frac{\sin^2 \beta}{2(1 - \sin^2 \beta)^{1.5}} \right) \triangle D \right]$$

$$. \quad . \quad . \quad \text{(Eq. 5)}$$

For any given instrument the value of dh/dD determined by equation 3 will be the average. If we assume the mean value of D to be 3" and $\triangle D = 0.005$" with $\beta = 60°$ we have:

$$\frac{dh}{dD} = \frac{1 + \sec \beta}{2} = 1.5$$

and: $\qquad \triangle h = 1.5 \cdot \triangle D = 1.5 \times 0.005 = 0.0075"$

If we now take equation 1 and solve for h at the nominal size and also at $D + \triangle D$, the difference of these values will give us $| \triangle h |$.

$$h = \frac{D}{2} + \frac{1}{2} \sqrt{D^2 - 4b^2} = \frac{D + \sqrt{D^2 - 4b^2}}{2}$$

Here $4b^2$ is equal to $D^2 \sin^2 \beta$. If β is 60°, $\sin^2 \beta$ is 0.75 and: $\qquad 4b^2 = D^2 \sin^2 \beta = 9 \times 0.75 = 6.75$

Then: $\qquad h = 1.5 + \tfrac{1}{2} \sqrt{9 - 6.75} = 1.5 + \dfrac{1.5}{2} = 2.25$

Now adding $\triangle D$:—

$$h + \triangle h = \frac{D + \triangle D + \sqrt{(D + \triangle D)^2 - 4b^2}}{2}$$

Let $\triangle D = 0.005$

$$h + \triangle h = \frac{3.005 + \sqrt{(3.005)^2 - 6.75}}{2} = \frac{3.005 + 1.50998}{2}$$

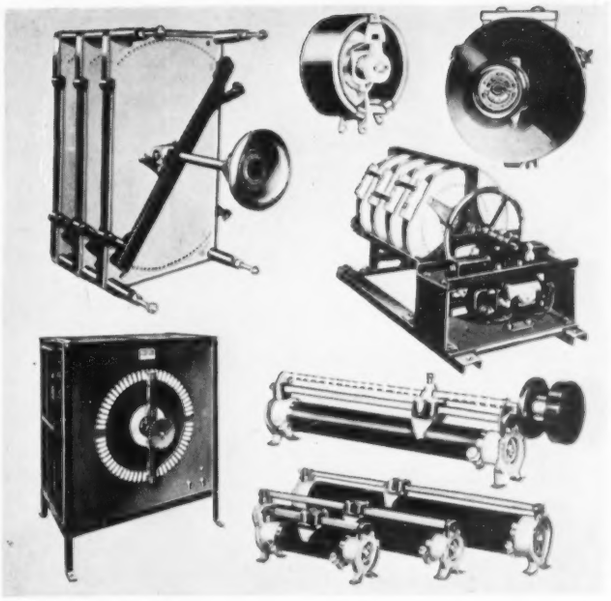
$$= 2.25749$$

$$\triangle h = 2.25749 - 2.25 = 0.00749$$

The error introduced by using the constant-ratio method is

$$0.0075 - 0.00749 = 0.00001"$$

From this it can be seen that if the dial of the bore gage is so graduated that it reads 0.005" when the contact has actually moved 0.0075" it will indicate the change in the diameter with an accuracy of 0.00001". Such precision is well within the tolerances of Defense production jobs.



A RHEOSTAT LINE THAT IS COMPLETE

The bulletins describing the various Ward Leonard Rheostats are probably the most complete compilation of Rheostat data ever assembled by a single manufacturer. They cover a range from the tiny types for fractional horsepower motors to the mighty multiple units that control the rolling of steel. The subjects of manual and motor drives, mountings and accessories are likewise completely covered. Ward Leonard is a quality line. Each item represents the "latest" in the field. Make your selection from the Ward Leonard data bulletins and be assured of a successful installation.

WARD LEONARD

ELECTRIC CONTROL DEVICES SINCE 1892

WARD LEONARD ELECTRIC COMPANY

38 South Street, Mount Vernon, N. Y.

Please send me complete set of your latest Rheostat Bulletins.

Name.....

Firm.....

Address.....

City ....State.....

Rapid Production Test for Case Depth

Awarded the $50 Third Prize in the Third Annual Instrumentation Contest.

By FRANK DEDEK

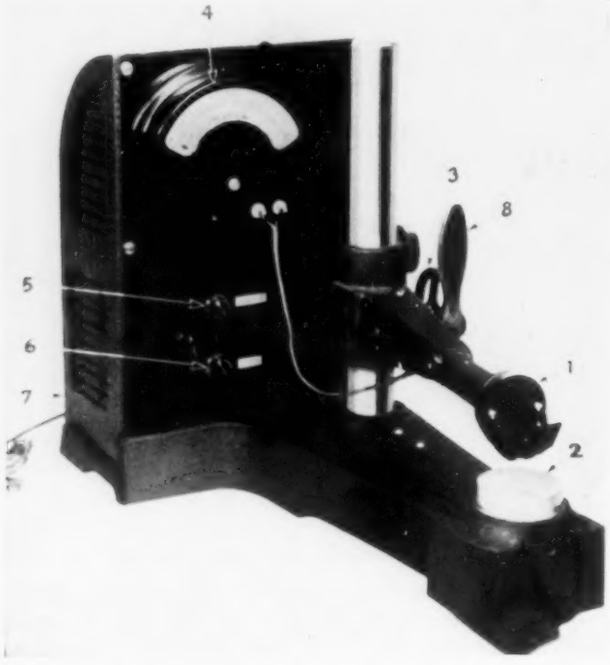
Consulting Metallurgist, Magnetic Products Corp., Detroit, Mich.

RECOGNIZING that industry lacks a production test for rapidly measuring and checking carburized case depths, and surface conditions of manufactured parts, the "Penetor," a magnetic tester, has been produced for this purpose.

DESCRIPTION

Test Unit 1 is designed to accommodate pieces of any shape. Flat, round or tapered parts are tested with equal accuracy because of the self-aligning features of this unit.

Interchangeable Anvils 2 permit the design of special nests and fixtures, while Pinion Gear Lift 3 is for height adjustment.



The linear Instrument Scale 4 is divided into one hundred divisions, spaced 1/16" apart to insure visibility to the operator. Readings are direct, and a pointer-limiting device has been provided to accelerate readings.

Knobs 5 and 6 are for standardizing surface and depth readings.

Oscillator Unit 7 to be operated on 115 volts, 60 cycles.

METHOD OF TESTING

Quotation from Hoyt's *Metallography* (1921) page 235:

That there is a definite relationship between mechanical and thermal treatment of steel and its magnetic characteristic has been shown by Robin, who gives rules and tables of data according to which the composition, thermal and mechanical treatments of any article of regular shape of steel or nickel alloy can be determined from the characteristic shapes of magnetic curves. The Bureau of Standards has also done considerable and very valuable work in this field. This work is so important and of such a nature that the originals should be consulted for the details.

A great deal of work has been done to correlate the grain structure and mechanical properties of ferrous alloys with resultant magnetic characteristics, but no simple device has ever been offered to put this method into practical use.

The Penetor fulfills the task of testing parts instantaneously without the need of consulting charts or tables, and in addition, it has the ability to measure the depth of case. Earlier forms of testing with high-frequency currents made use of an a-c. bridge, in which the impedance of a coil surrounding the test specimen is balanced either against a standard specimen in a similar coil, or against a synthetic standard of equal impedance. The Penetor uses a basically different method. When a test piece is placed under the test unit and handle 8 is brought forward to a stop, alternating flux will flow in the test piece. This flux will be dependent upon the reluctance of the magnetic path of which the test piece is now an integral part. The resultant variation in reluctance is measured by a variation of current in the instrument and interpreted in terms of hardness. Two fixed high frequencies have been selected to cover surface and depth readings. An added feature of this device is the "spot test," meaning that readings are only taken in a small area, and at a predetermined controlled depth. The prior attempts merely gave a reading of the average condition of an entire test piece and could not locate local defects of any given or limited area of the material tested.

Frank Dedek was born thirty-seven years ago in Stuttgart, and is a graduate of the Polytechnic Institute of that City. He studied Metallography at the Detroit City College. For the past seventeen years he has been associated with several industrial plants in Detroit, doing experimental research work. He also serves as a consulting metallurgist and makes a particular study of applications to magnetic steel testing.

Special preparation of pieces to be tested is unnecessary; no marring or deformation will take place, as the test unit need only touch lightly, and only for a moment, the surface of a part, to obtain a reading. However, a certain procedure has to be followed to successfully employ this new method. For production testing, the instrument is used as a comparator. Material of a certain alloy should be compared with a master sample of like composition and the necessary heat treatment.

For example, the 100% inspection of wrist pins, not only for depth of case, but also for skin hardness:

All that is needed for this test is to prepare one wrist pin to the desired specifications, establish a reading on the instrument scale for this particular part, set limiting device on scale to the tolerance that is permissible, and the operator may now proceed with the test by simply placing parts on the anvil, actuating the handle and observing the position of instrument pointer. As many as 1800 case depth measurements per hour may be accurately taken.

To further increase the operating speed, the Penetor may be equipped with a foot pedal or motor, as desired. For large work the test unit may be removed from its mounting and used as a hand tester. This has been found extremely useful for locating welding stresses and testing for hardness or defects at normally inaccessible places such as the inside of sleeves, dies or cylinder blocks.

THE PENETOR IN PRACTICE

The applications for which this device may be used are innumerable, but the following explanations and charts of the results of tests are a fair indication of the possibilities for this test instrument: *(Concluded on page 24)*

Taylor Is Helping America Hang Up a Sign

HAVE you seen the signs? Look anywhere. Look in that factory, out Seattle way. There's the sign—*This Load Ready to Move*—on that bin of finished bolts. Look in that big airplane plant. There's the same sign, on that sleek Army streamliner. Look in that oil refinery. See the sign, over there, on that string of flat cars? It's on that mountain of clothing, too—it's on that pile of canned foods.

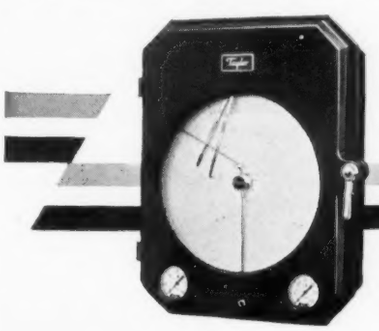
American Industry is producing at top speed today. Producing the goods that this nation needs. Producing faster, much faster. In a steady, reassuring, growing stream, vitally necessary products are rushing out of plants and factories. America is going to be ready, just in case . . .

Preparing to protect ourselves and our ways is a huge job that can't be done slipshod. We've got to work well, and we've got to work fast. We *are* working fast. We can do it, because we're lucky.

No other Industry in the world is equally equipped to produce quality in high gear. No other Industry has better, more modern machines. No other Industry has finer instruments to *help* these machines produce.

Times like these make instruments like the great new Taylor Fulscope Controller an absolute industrial "must." Today all plant operations *must* be automatically more exact, automatically more foolproof, automatically faster, more efficient. Machines must think for themselves more clearly. The Taylor Fulscope helps them to do that.

Taylor Instruments have never had a bigger opportunity to "show their stuff." Fact is, these are Taylor times. Taylor Instrument Companies, Rochester, N. Y. Plant also in Toronto, Canada.



The New Taylor Fulscope Controller
The "Not 1, but 5" Instrument

BE PREPARED WITH **Taylor**

Indicating / Recording · Controlling

TEMPERATURE, PRESSURE, FLOW
and **LEVEL INSTRUMENTS**

Tungsten Production from American Ores Increased by Instrumentation

Awarded a Fourth Prize in the Third Annual Instrumentation Contest.

By WILLIAM H. SAYLER
Manager, Specialty Sales Co., Salt Lake City, Utah

ONE of the strategic metals in our defense program is tungsten. This article will briefly describe one of the principal control problems involved in making available several million pounds of tungsten that would not otherwise be available. The Nevada Massachusetts Company at Mill City, Nevada, has been operating since 1918 on a metallurgical process that left a fraction of one per cent of tungsten in the tailings, of which there are now several million tons. With the rise of the present emergency the management decided to coöperate to the fullest extent with the defense program by installing a complete plant to recover the small percentage of tungsten still in these tailings.

A small pilot plant was built to determine the best method of handling this material. The process finally used consists essentially of a classifying and grinding operation to prepare the material for flotation, using selective flotation for making the final separation. A scalping flotation is used first, to remove metallic sulphides, principally iron and copper, from the ore pulp. After this operation the ore is further conditioned so that the tungsten ore, which is present as scheelite, may be floated, and recovered.

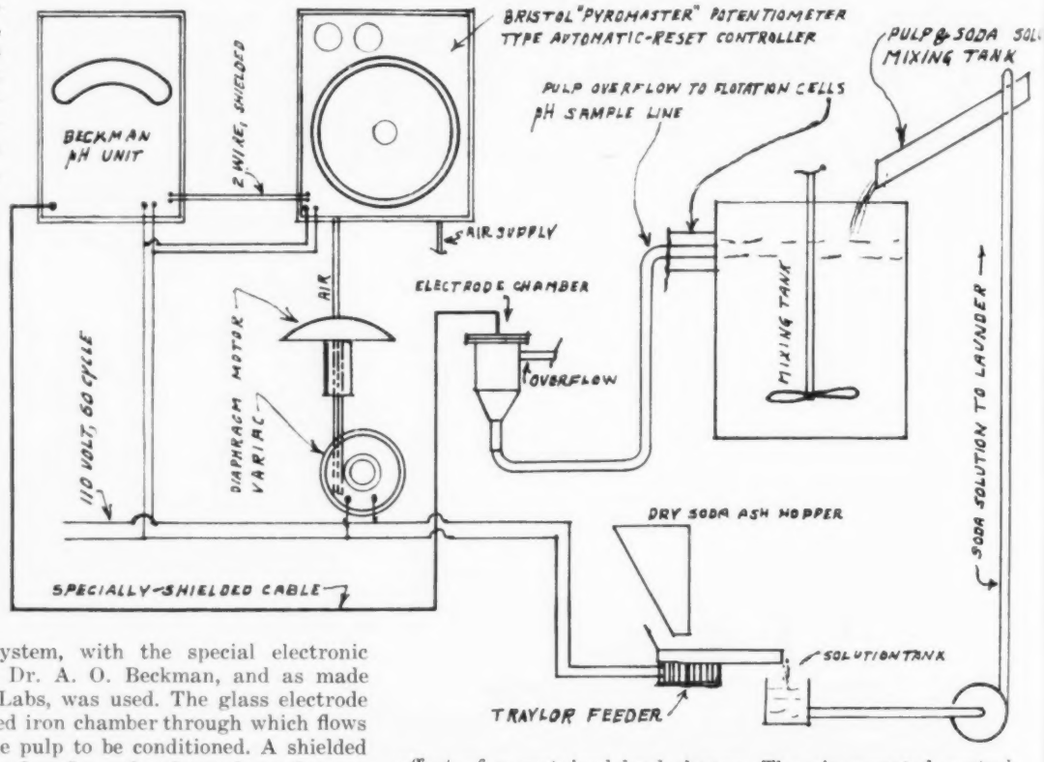
Mr. George Crerar, metallurgist for this company, found that it would be possible to operate this process economically and make it financially attractive, only if close control of pH value in conditioning for the flotation process could be obtained. Through one of our company's connections, the problem of control was referred to me.

A study of the process was made and a system of control was recommended. The mining company accepted the recommendation and installed the system. For measuring the pH value, the Beckman glass electrode system, with the special electronic amplifier developed by Dr. A. O. Beckman, and as made by National Technical Labs, was used. The glass electrode is mounted in an enameled iron chamber through which flows a constant sample of the pulp to be conditioned. A shielded cable runs about seventy feet from the electrode to the amplifier, which is mounted on a panel board at a convenient point. Also, on this panel board is mounted a Bristol Pyromaster air-operated reset type automatic controller, with a chart range of 6-13 pH. Its controlled air line goes directly to a diaphragm motor, which, through a rack and pinion, operates a General Radio Company Variac. This Variac impresses a continuously-variable voltage on a Traylor Vibrator type feeder, which in turn feeds the amount of soda ash required to maintain the pH value at the proper point.

The reset type controller was chosen for the process, as there are several variables in the process which have the effect of a sustained load change. The air-operated control system was chosen, even though the final control is electrical, to obtain adjustable throttling range and adjustable rate of reset. Also the air controller is rugged, trouble-free, and immune to vibration. With extreme load changes, the pH of the pulp does not change over one-tenth of a point, and then only for five minutes.

So far as the writer is aware, this is the first installation in the United States, of this type of control on the flotation process. It is of peculiar interest, in that it is an instance of the application of coördinated control in making feasible the recovery of several million pounds of a valuable strategic metal that would not otherwise be available.

"Born in Indiana, grew up in South Dakota, graduated from High School at Mitchell, S. D., 1917. Four years as a range rider, then two years at South Dakota School of Mines where a professor of English taught me that the English language is just as important as mathematics to an engineer. Left school to go to work for J. C. Buckbee Co., Chicago, first as a cub, later as field engineer, principally on cement mill construction. After four years with this firm. I spent my savings poking around the Black Hills mining district, then spent a few months on survey work with a consulting geologist. Employers following were Denver & Rio Grande RR. Co., Utah Copper Co., Counterflo Heater Co. (since defunct), a contractor (financially defunct now). Then came the depression. I couldn't find a job, so with the savings of a friend, who is now my partner in business, we started the Specialty Sales Co. That was in 1931. The first years were lean, but we hung on, and here we are. . . . "



Use of a Standard Rectifier Type A-c. Microammeter as Averaging Device

Awarded a Fourth Prize in the Third Annual Instrumentation Contest.

By WAYNE T. SPROULL
General Motors Research Laboratories, Detroit, Mich.

A COMMON problem encountered in many branches of instrumentation, and especially in electrical measurements, is the problem of accurately measuring the average value of a magnitude which varies irregularly and rapidly over a wide range. As an impractical but instructive example, suppose that you were asked to weigh a person who is performing a violent and erratic tap dance upon the platform of a platform scale, so that the pointer is furiously whipping around every mark on the dial. If you used a high-speed motion picture camera to obtain several hundred individual readings, you could determine the dancer's weight with considerable accuracy by averaging all of these readings, but is there not some easy, cheap, and practical way to do this?

The advent of the electrolytic condenser and the copper oxide rectifier in recent years has indeed given us a method which offers an easy, cheap and practical solution for the above problem.

Today you can buy for a few dollars a condenser having a capacity of 5000 microfarads. It weighs only about a pound and it will slip into your coat pocket. Such a thing was unthinkable just a few years ago.

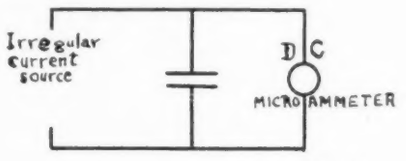


Fig. 1

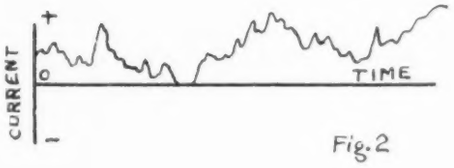


Fig. 2

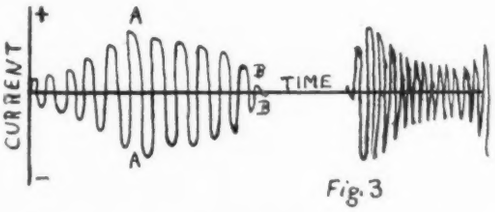


Fig. 3

One of these condensers shunted around a d-c. microammeter as shown in Fig. 1 will cause the instrument to indicate the average value of a unidirectional current varying irregularly as shown in Fig. 2. The condenser will charge up until its voltage is sufficient to cause a steady discharging current through the instrument just intense enough to balance the average input of the irregular charging current being measured.

A more difficult problem, however, is to determine the average value of an irregularly varying alternating current such as that shown in Fig. 3, which shows the type of current we might expect from the output stage of an audio-frequency amplifier. An a-c. instrument indicating this current would jump rapidly between high readings such as at instant *AA* and low readings such as at instant *BB*. Shunting such an instrument with a high-capacity condenser as in Fig. 1, however, would merely cause it to register zero,

Wayne T. Sproull was born in Wisconsin in 1906, and his parents immediately moved to Pittsburgh where he attended common school. In 1918 he moved to Akron, Ohio, where he attended high school and later the University of Akron (B.S. in physics, 1927). Then to Lehigh University (M.S. in physics, 1929), then to the University of Wisconsin (Ph.D. in physics, 1933). Since early 1933, physicist in the G M Research Labs. The device here described, however, was evolved in the course of some consulting work unrelated to GM.

which is the average value of the current considered as direct.

The advent of the copper oxide rectifier has enabled the electrical instrument manufacturers to put on the market the so-called rectifier type a-c. microammeters. Although sensitive (100 microamperes full scale), these instruments are small and portable, being about three or four inches in diameter and less than two inches thick, and the cost is around $20. These instruments contain a small full-wave copper oxide rectifier, *RR*, Fig. 4, and a regular d-c. microammeter *A*. Alternating current entering at the binding

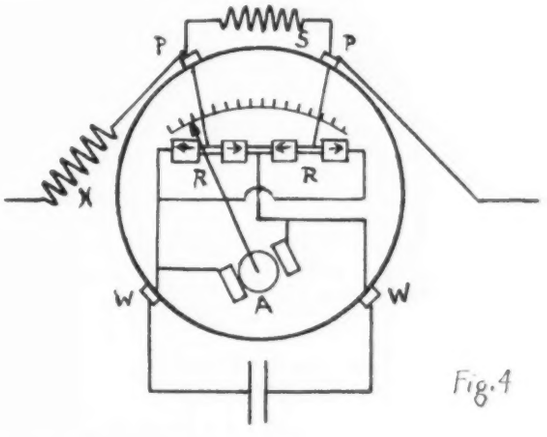


Fig. 4

posts *PP* first goes to the rectifier where it is changed into pulsating d.c. which is then measured by the d-c. instrument.

It is a simple matter to open the case of one of these instruments and solder two extra lead wires, *WW*, to the wires running from the rectifier to the instrument proper. If these extra lead wires are now connected to a high-capacitance (1000 to 5000 μfd.) electrolytic capacitor, the instrument will read the average a.c. when the regular binding posts *PP* are connected to an irregularly varying alternating current.

Such an instrument as this will measure the average value of any sort of current, either alternating or direct, whether steady or fluctuating in any manner whatsoever.

If the current to be measured is too large for a microammeter, the instrument can of course be provided with a shunt *S* having appropriate resistance. Or, if it is desired to measure a varying voltage rather than a varying current, a series resistance *X* of the proper value will convert the instrument into an averaging a-c. voltmeter.

Since almost any physical magnitude, such as force, distance, temperature, pressure, light intensity, sound intensity,

etc., can be converted into a corresponding current or voltage, the device shown in Fig. 4 can be used to measure the average value of practically anything which fluctuates too rapidly to follow with an ordinary instrument and too slowly to average with an ordinary instrument.

One simple obvious application of this device is in the measurement of the sound level in a room where perhaps an orchestra is playing. An ordinary sound level meter will indicate rapid irregular variations of the sound intensity as each note is played, but the use of this averaging meter results in a steady average reading. During a crescendo passage, the pointer will move slowly upward along the scale as the average sound intensity increases; and as the music gradually subsides from fortissimo, the needle will move slowly down again, accurately showing the general trend of the intensity without all of the confusing erratic detailed fluctuations.

With a 5000-μfd capacitor, the average obtained covers a longer period of time than with a 1000-μfd capacitor. The more completely you wish to "iron out" minor irregularities the larger the capacitance you should use.

The necessity which led to the development of this averaging device arose during the development of an instrument for measuring the degree of discomfort suffered by passengers riding in automobiles or other vehicles due to jolts arising from rough roads or uneven track. Each individual jolt encountered during a ride of course gave a corresponding pulse in the meter reading, resulting in erratic indications. A steady reading was desired which would be an accurate measure of the average roughness. The device just described made it possible to obtain this accurate average. The riding comfort meter mentioned, known as the PRCA Riding Comfort Indicator, is now sold by the Commercial Engineering Laboratories, Detroit, Michigan.

Fluorescent Spotlight for Inspection

Awarded a Fourth Prize in the Third Annual Instrumentation Contest.

By WILLIAM TOBIAS

Junior Inspector of Ordnance, War Department

ONE does not have to look far today to see the important role that fluorescent lighting plays in facilitating defense work. With many plants operating on a twenty-four hour schedule, it is of utmost importance that a lighting condition approaching that of daylight be maintained at all times. This is especially true in regard to the inspection of material, since most efficient inspection can be carried out in daylight. The daylight Mazda F lamp has a color temperature of 6500° Kelvin which is a close match for average daylight.

There are a number of conditions encountered in inspection work where an ordinary incandescent bulb is unsatisfactory. If paint is to be applied to the interior of a metal tube it is important that rigid inspection be given after shot-blasting to ensure that there are no pits, cracks, laps, or seams that a coat of paint would obscure. It is also necessary in many cases to obtain complete paint coverage on the inside of pipe. In bomb manufacture, for instance, it is highly important that the inside of the bomb receive a thorough coating of an anti-acid paint. It is difficult to find "bald" spots on the inside of a painted tube with only the aid of an incandescent bulb because of the glare set up.

The device that I propose for the inspection of metal cylinders is a daylight fluorescent lamp enclosed in a cylinder of transparent Lucite so that it can be used as a searchlight. Due to the tubular shape of the bulb an even distribution of light could be obtained which would eliminate glare and provide a close approach to daylight inspection conditions. Since a fluorescent lamp produces one-half of the total heat and one-fourth of the radiant heat of a comparable incandescent bulb, it would be easy to handle. The closely-fitting Lucite cover would protect the bulb and at the same time provide more heat insulation. The small ballast device, which makes possible the use of alternating current at 120 volts, and the starting switch, could be incorporated in a handle. The unit would then be ready for use by merely plugging in to the nearest electric outlet.

Born in Pittsburgh 22 years ago. "Pop" Dysart's famous Physics classes in Schenley High directed him toward matters scientific. After graduating he helped dig Pittsburgh out of the 1936 flood mud. Won a scholarship to Carnegie Tech which he held for four years; graduated with a B.S. in M.E., June 1940. It was while working on the night shift at the National Tube Co. as an ordnance inspector that he conceived the idea of the fluorescent flashlight. He has just been promoted to Junior Engineer with the War Department.

Safety Inspection of Trains *en Route*

Awarded a Fourth Prize in the Third Annual Instrumentation Contest.

By A. E. F. BILLSTEIN

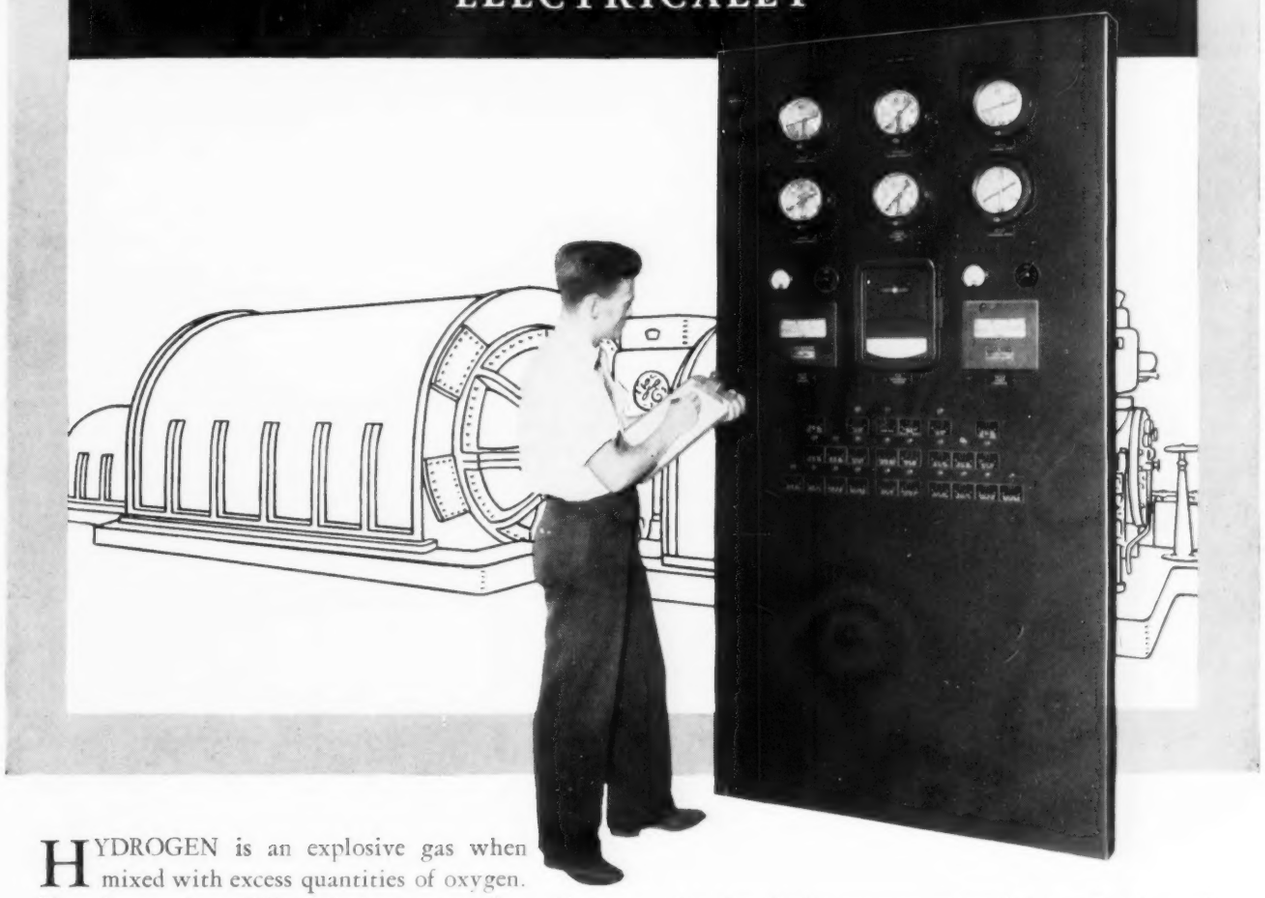
Assistant Engineer, Pennsylvania Railroad, Altoona, Pa.

NATIONAL Defense depends largely upon safe and speedy transportation. Machine tools, engines for our air forces, armor for our Navy, guns for the Army and thousands of other items must not only be produced but quickly transported. In the production of these items from components, likewise, transportation holds an important place. Fortunately for our country, the railroads are now operating more efficiently and at higher speed than those of any other nation. To maintain the present degree of safe transportation, systematic inspection is constantly

[To be concluded in an early issue . . . we hope! It depends upon the Pennsylvania Railroad AGAIN granting the permission which it had originally granted and which it withdrew, we were informed, when this issue was about to go to press.—EDITOR.]

Arthur E. F. Billstein, born in Chester, Pa., in 1895. World War service in France as Master Engineer in the 28th Engineers. Completed college education after returning from France. B.S. in E.E., and E.E., University of Pennsylvania. Entered special apprenticeship course in signal department of Pennsylvania Railroad. At present employed at the PRR Testing Laboratory. Married, two children and superintendent of the Methodist Church School. Taught Electrical Engineering at the Penn State Extension School. Past President of Altoona Engineering Society.

To Measure HYDROGEN PURITY ELECTRICALLY



HYDROGEN is an explosive gas when mixed with excess quantities of oxygen. Therefore, when filling hydrogen-cooled turbine-generators, converters, and condensers, it is necessary to know the hydrogen concentration at all times.

To fill the casing, carbon dioxide is pumped in, and air is let out until the percentage of carbon dioxide in air is about 70 per cent. Hydrogen is then admitted until the percentage of hydrogen in carbon dioxide is about 97 per cent. A somewhat similar reverse procedure is used to empty the casing.

This operation requires a means of measuring the various gas mixtures in order to prevent the formation of an explosive mixture. The changing analysis of the gas must be known throughout the operation, and particularly at the changeover points, so that safety of the procedure is assured. This requires an indicating instrument, for chemical analysis is too slow, as well as too expensive.

An electric instrument, operating on the thermal-conductivity principle, was developed by G-E engineers for this purpose. In addition to giving a continuous analysis, it indicates the purity of the hydrogen after the casing is filled, and while the machine is in operation. By means of an alarm system, it gives both visible and audible warnings, should the hydrogen mixture drop below a predetermined percentage.

In addition to building instruments for special measurement problems, G.E. offers a complete line of standard instruments for the measurement of any electrical quantity—current, voltage, resistance, watts—in styles and ratings to fill every need. When you have a problem that involves measurement, let us help you solve it. General Electric Company, Schenectady, N. Y.

HEADQUARTERS FOR ELECTRICAL MEASUREMENT

GENERAL ELECTRIC

902 14

Stroboscope Tests Dynamic Unbalance in a Large Water-wheel-driven Generator

Awarded a Fifth Prize in the Third Annual Instrumentation Contest.

By CLAYTON M. SHERER

Ass't Chief of Tests, Pennsylvania Water & Power Co., Holtwood, Pa.

AN Edgerton stroboscope has been successfully used in the study of dynamic unbalance in a 42,500-horsepower water-wheel-driven electric generator. The technique employed in this particular problem can be applied to the dynamic balancing of any piece of rotating machinery while running under normal operating conditions, provided that its rotative speed is within the physical limits of an ordinary dial indicator to follow the shaft oscillations. The machine which is the subject of this discussion is a large vertical alternator, running at a speed of 109.1 r.p.m. Total weight of the rotating parts is approximately 1,148,000 lbs. Two guide bearings are used, one being located just above the turbine runner, and the other at the generator. Distance between these two bearings is about thirty feet. Dynamic unbalance of the rotating mass was sufficient to produce, with full load on the generator, shaft oscillations of 0.013″ at the generator bearing, and 0.026″ at the turbine bearing. Before any remedial measures could be applied it was necessary to determine, first, whether the unbalance producing the oscillations was in the turbine or in the generator, and second, after this was done, to determine the position of the "high side" in the machine, that is, at what point in the rotor the excess weight producing the oscillations is located.

Mr. Sherer sent in a brief biography which we print in full: "I was born on a farm at Manheim, Pa. Graduated from Manheim High School. Attended State Teachers' College and taught in public schools. Graduated from Gettysburg College in 1920. Worked one year for General Electric Lamp Works at Newark, N. J., on development and test of lamp machinery. Present connection with Pennsylvania Water and Power Co. dates from 1921."

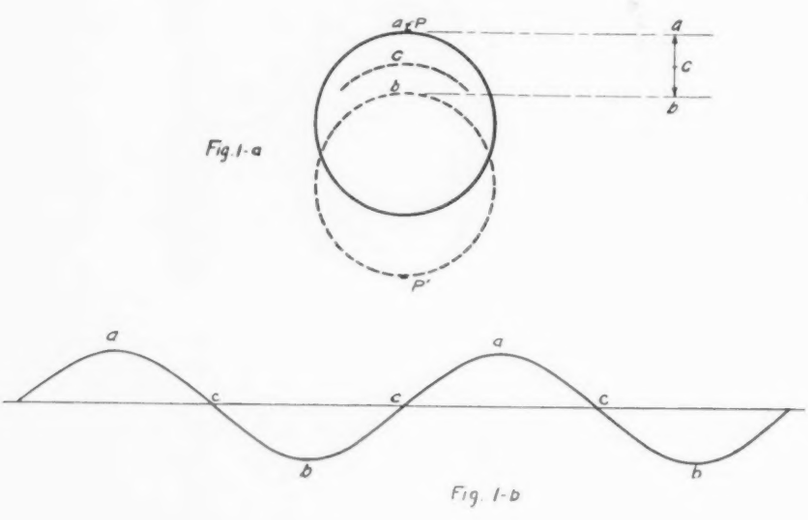


Fig. 1-b

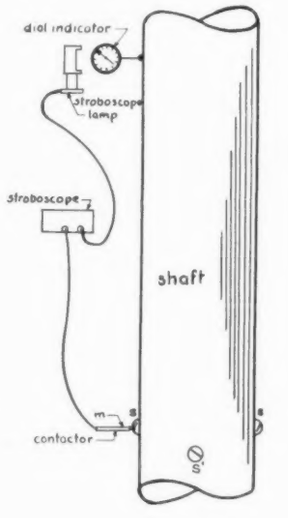


Fig. 2

The vibration of a shaft can be represented by plotting the motion of a point on the high side against time. In Fig. 1-b the sinusoidel displacement of such a point is shown plotted against time, or angular displacement of the shaft. The shaft oscillates back and forth from *a* to *b* as point *P* rotates on the shaft (Fig. 1-a). At a given instant the shaft will be in the position shown at *a*. After one-half revolution, or when *P* has moved to *P'*, the shaft will be in position *b*. At the quarter and three-quarter parts of a revolution, the shaft will be midway between *a* and *b*, or *c*. This movement of the shaft, shown in Fig. 1-a, is plotted against time in Fig. 1-b.

In studying vibration in this case, an ordinary dial test indicator was used to measure the amplitude of oscillation. An Edgerton stroboscope was used to find the location of the high side in the rotating mass. The crux of the whole balancing problem was in being able to locate this, for by that means it was easily possible to observe the effect of corrective weights added to reduce the unbalanced condition.

The diagram in Fig. 2 illustrates the method of test. Two brass machine bolts, *s*, were screwed into the shaft 180° apart and at the same elevation. These served as contacts for flashing the stroboscope lamp. The pointer of the dial indicator, placed as shown, moves back and forth as the shaft oscillates between *a* and *b* (Fig. 1). By going around the shaft with the movable contactor, *m*, the instant of lamp flash is advanced or retarded until it occurs at *c*, that is, at the oscillation mid-point. At this point the indicator pointer appears to be standing still at 0 on the dial, being illuminated twice per revolution of the shaft. The movable contactor is then dropped vertically downward about one-half inch to make contact with a third fixed contact, *S'*, placed half way between the first two. This produces a flash at either *a* or *b*, and from the indicator deflection it is possible to tell which one, that is, whether it is the maximum high side *(a)*, or maximum low side *(b)*. With contactor *m* in this position, the angle *d* between the dial indicator and contactor *m* is measured. Upon shutting the machine down, the actual high side in the rotor is found by laying off angle *d*, measuring from contact *S'* on the shaft.

The method here described is simple, positive, and easy to use. It has been applied in the study of vibration on a number of large machines.

Automatic pH Control Converts a Batch Process to Continuous-flow

Awarded a Fifth Prize in the Third Annual Instrumentation Contest

By CHARLES E. DIEHL
Toppenish, Wash'n

"Born in Utah, educated in Salt Lake City High School and University of Utah. Financed way through by working alternate years as electrician. Education was in chemistry and electricity. Total use of chemical education was one year of chemical research with the American Smelting and Refining Co. Since then, mostly Chief Electrician on construction of metal mills, coal mines, power plants and sugar factories. At present Chief Electrician of Utah Idaho Sugar Co., with which company, intermittently, a total of over 14 years. World War vet., mem. Am. Legion. Hobby, study of electrical instruments and attempt at design of new types and new uses. This hobby fills corners of the house with junk and drains the pocketbook."

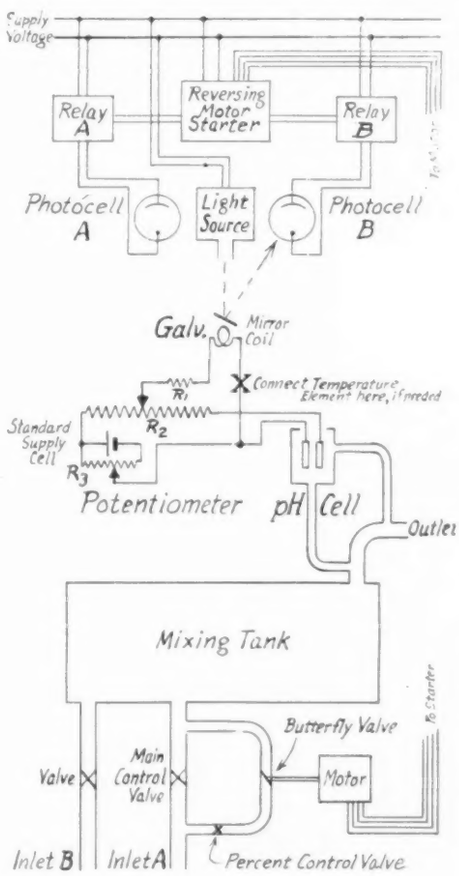
MANY chemical reactions have their end point characterized by a constant value of hydrogen-ion concentration. Batch production is often controlled by using a pH indicator of some kind, but batch or one-tank-at-a-time production is slow compared with continuous flow methods where two or more ingredients are mixed by passing through a tank slowly enough to produce complete reaction. Control of this type is manual and subject to the erratic results of that class of operation. Both analytical and electrochemical indicators are used in the continuous flow work. (Leeds & Northrup pH recorder, Central Scientific Co. colorimetric methods, etc.)

Where more than two chemicals are used that enter into the complete reaction, more than one operation is necessary in continuous flow work if automatic control is to be effective. This results in a production line effect from raw materials to the finished product, each step of which may be automatically controlled. Control is achieved by passing a small sample of the completed reaction through an electrode bowl which indicates by the potential developed therein the pH which registers on a more or less standard potentiometer circuit. The potentiometer's galvanometer, in turn, is the control for any desired percent plus or minus, of the flow of one chemical entering the reaction. By varying the sensitivity of the galvanometer and the percent of the whole flow of liquid that is controlled, stable operation is achieved. The desired pH to be arrived at is under control of an operator or chemist who has only one adjustment to make to alter this value to any other value which will then be maintained.

Standard potentiometer circuits are used, either with or without temperature correction. This correction is unnecessary in most cases as the rule is constant temperature automatically maintained in most reactions in which a uniform product is desired.

The instrumentation problem is that of opening or closing a valve or valves without imposing any load on the galvanometer and yet have this galvanometer control the valve movement. Mechanical means were obviously impossible. The photoelectric cell was the final means chosen, with the actuating light furnished by reflection from the galvanometer mirror. Relays in conjunction with these photocells control a motor reversing line starter with the motor geared to the valve to be moved. Time of operation of this valve is a bit critical and is a function of mechanical speed reduction only. Little power is required here, as the valve is a butterfly by-pass and the pressure difference is not great.

Operation as shown in the diagram is general only. No attempt is made to show actual mechanical construction. However, it is a technically correct flow sheet. A constant pH in solution will, with proper electrodes, give a constant emf. This emf. is generated in the electrode cell through which a small portion of the finished reaction flows. First we establish the desired pH and balance R_3 which adjusts the potential of the supply to equal that of the electrode cell. As the two cells are hooked negative to negative and positive to positive through the network of the potentiometer and the galvanometer, no interchange of current takes place and the galvanometer centers. Any deviation of the pH in the electrode cell produces a change in potential and current flows through the galvanometer. Deflection of the coil moves the mirror and the light strikes the photocell which may be photocell B, closing relay B which in turn closes the motor reversing starter to start the motor in the desired direction. The butterfly valve is then changed in position to either increase or decrease a portion of the flow of inlet A to the mixing tank. Constant flow of other ingredients being maintained at inlet B, the proportion of mix is changed directly by the change of pH of the finished product.



R_1 controls sensitivity of the galvanometer. R_2 is the potentiometer resistance and requires one calibration adjustment only. R_3 is the laboratory control and is varied to suit the desired pH in the product flowing through the electrode cell.

Semi-oscillation of the butterfly valve is constant. These minute changes of position of the valve average up and a constant pH control results. Overall variation of the finished product of the controlled reaction is much less than the individual variations between separately produced and controlled batches. The speed of production is practically doubled for the same tank capacity and same piping systems.

Where there is a deviation of temperature in any reaction where an electrode potential is used to indicate the pH of a solution, it becomes necessary to place a thermocouple in the electrode cell. This thermocouple is in series with the galvanometer and balances the variation in potential of the electrode cell due to temperature changes. Such a connection is made at X in the diagram.

Automatic Safety in Production Testing

Awarded a Fifth Prize in the Third Annual Instrumentation Contest.

By EDWIN E. TEACH
Ingersoll-Rand Co., Painted Post, N. Y.

PURPOSE of the automatic system to be described is to provide protection to machinery being "run in" for test purposes without attendance; and to provide a means for determining friction horsepower after the running-in period.

An important factor in the manufacture and operation of rotating and reciprocating machinery is the friction between moving parts. The operating efficiency of many types of machines is given considerable attention by industry today. Since a reduction in the loss of horsepower due to friction improves the efficiency, it becomes necessary to make careful studies to control this kind of loss.

The measurement of friction horsepower is a comparatively simple problem for the research staff of any competent engineering group. However, when it is desired to determine the friction horsepower of every unit in production, the time for measurement, the cost of this operation, and the inconvenience to production must all be given careful consideration. The writer designed an automatic arrangement using standard control equipment listed in the catalogues of various manufacturers. This control is suitable for use with any rotating and reciprocating machinery such as natural gas, gasoline, and oil engines, steam engines, compressors, or any units which can be arranged so that the machine can be driven externally either through a coupling or by a belt-wheel.

The actual friction horsepower is kept to a minimum by proper lubrication of the moving parts. During the period of "running in" the friction horsepower may be measured and used as a general index to determine if lubrication is adequate. The control devised for this testing is arranged to give absolute protection to the machinery being "run in." This protection eliminates the necessity of an operator on duty and reduces the cost of testing.

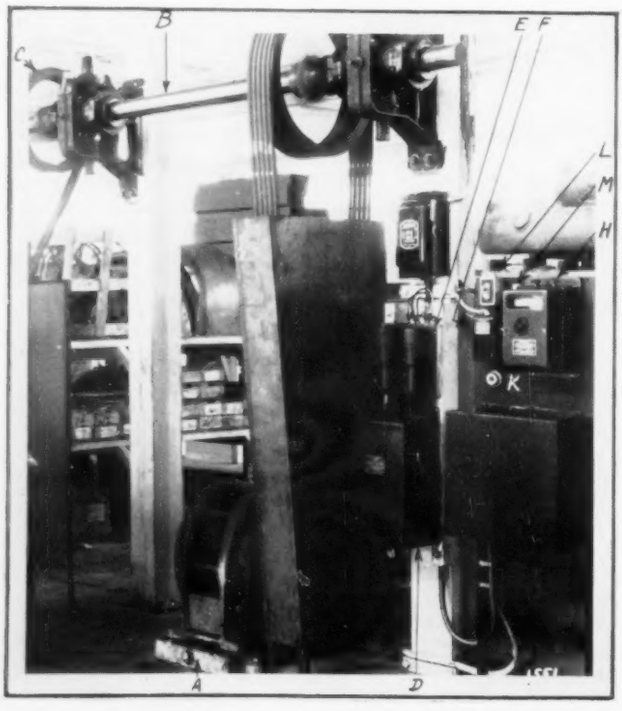
Born in St. Paul, Minn., in 1913, Mr. Teach obtained his high-school education in Chicago. B.S. in E.E. Iowa State College, 1935. Eta Kappa Nu, Tau Beta Pi, Phi Gamma Delta. Having concentrated his college efforts on electrical power machinery, he entered this branch of engineering upon graduation, joining Ingersoll-Rand. After several months' training at the main I-R plant he was put in charge of the electrical engineering dep't of the I-R factory at Painted Post, N. Y. Principal work of dep't: application of motors and control to all types of air compressors.

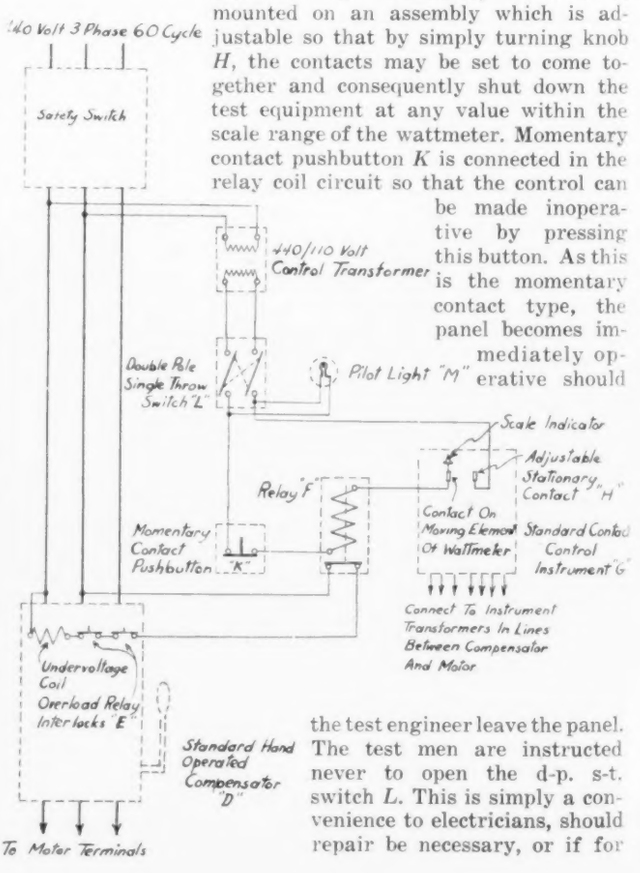
DESCRIPTION

Motor *A* is belted to line shaft *B* which has several belt wheels *C* spaced evenly over the test floor. There is a belt wheel for each unit so that all of the machines tested are driven by motor *A*. Current to the motor is supplied through the manual reduced voltage starter *D*. The interlocks *E* of the overload relays of the starter are connected in series with a normally-closed relay *F*. Standard contact-making wattmeter *G* is connected in the line between the starter and the motor. When the motor is running, the power to the motor is indicated on the wattmeter. The contact in the wattmeter is arranged so that when the power required exceeds a certain value, a circuit is completed to relay *F*, opening the overload relay circuit which deënergizes the undervoltage coil in the starter and this takes the motor off the line. The tripping value is adjusted by turning adjustment knob *H*.

Since the standard contact-making wattmeter is furnished with contacts which are not suitable for voltages over 250, a control transformer is used to reduce the voltage in the contact circuit to 110 volts. The contacts complete a 110-volt circuit to relay *F* and the normally-closed contact of relay *F* opens the under-voltage coil circuit of the standard compensator to shut down the motor whenever the contacts in wattmeter *G* come together.

In the wattmeter, one contact is mounted on the moving element. The stationary contact is mounted on an assembly which is adjustable so that by simply turning knob *H*, the contacts may be set to come together and consequently shut down the test equipment at any value within the scale range of the wattmeter. Momentary contact pushbutton *K* is connected in the relay coil circuit so that the control can be made inoperative by pressing this button. As this is the momentary contact type, the panel becomes immediately operative should the test engineer leave the panel. The test men are instructed never to open the d-p. s-t. switch *L*. This is simply a convenience to electricians, should repair be necessary, or if for




440 Volt 3 Phase 60 Cycle
Safety Switch
440/110 Volt Control Transformer
Double Pole Single Throw Switch "L"
Pilot Light "M"
Scale Indicator
Adjustable Stationary Contact "H"
Relay "F"
Contact On Moving Element Of Wattmeter
Standard Contact Control Instrument "G"
Momentary Contact Pushbutton "K"
Connect To Instrument Transformers In Lines Between Compensator And Motor
Undervoltage Coil
Overload Relay Interlocks "E"
Standard Hand Operated Compensator "D"
To Motor Terminals

Detects trouble

BEFORE

a breakdown

Shallcross Milliohmmeter

.00001 to .5 ohms

Skilled and unskilled operators alike find this rugged, low-cost milliohmmeter easy to operate—accurate — dependable. The actual resistance is read directly from the scale—no reference curves or charts required. Measures low resistances of armatures, field and transformer coils, fuses, rotary and switch contacts. Locates oxidized and pitted contacts, weak springs, etc. AN IDEAL PORTABLE BONDING TESTER.

Send for Bulletin #671-HIS

Shallcross Mfg. Co.

Instruments—Resistors—Switches

COLLINGDALE, PA.

They're as Different as Your

HUMIDITY CONTROL PROBLEMS

★ Johnson room type "humidostats," as illustrated (and also those of the insertion pattern to sense humidity in ducts), are provided with any one of a number of different types of elements, to fit each particular application.

"LOOK AT THE WHOLE SYSTEM"

That is the *Johnson* thought behind the selection of exactly the proper type of "humidostat" for each individual humidity control installation. In solving automatic temperature and air conditioning control problems, always in the minds of *Johnson* engineers is the indisputable fact that even the most efficient devices are valuable only when they function perfectly as part of the whole . . . Almost every installation differs as to the relative humidity to be maintained and the dry-bulb temperature with which that humidity is associated. Various materials, which respond dependably to changes in the moisture content of the surrounding air, are affected differently under each set of conditions. That is why *Johnson* offers "humidostats" with any one of several types of elements, such as animal membrane, human hair, wood in various forms, and other substances . . . Ask for bulletins describing *Johnson* room and insertion type "humidostats." There is no obligation. A post card will bring them.

JOHNSON

AUTOMATIC TEMPERATURE AND AIR CONDITIONING CONTROL

JOHNSON SERVICE COMPANY, MILWAUKEE, WIS. AND PRINCIPAL CITIES

some other reason it is desired to disconnect the control for a definite period. Pilot light *M* is a tell-tale that the panel is in operation and the head of the Test Division never runs machinery on the test beds unless this light is on.

OPERATION

After the Test Division has set up the proper number of machines on the test beds, the motor is started. During the starting period, the test engineer presses pushbutton *K* to keep the control inoperative until the motor is up to speed. After the motor is up to speed, the wattmeter indication will drop off slowly as the oil works into the moving parts. Matching this drop in load gives the test engineers a picture of the time required before lubrication has its full effect. This is one of the important features of this control.

The next step is to set the stationary contact for the tripping valve. No tables must be consulted nor calculation need be made as the operator simply looks at the scale indicator and sets the tripping valve slightly above the operating wattage as indicated. This simple operation is a great benefit when testing machines being produced in quantity. Any abnormal condition prior to setting the tripping value is immediately apparent since the operator through experience knows roughly what the indicated kw. should be. Experience has shown that the tripping value can be easily adjusted to be only 2% above the operating load. This certainly affords much more protection than given by the common overload relays as used in industrial control apparatus.

CONCLUSION

This control equipment is well adapted for production testing since the friction load can be determined on each machine independently by simply putting the belts on or off the individual units. A group of units may run simultaneously to wear in the moving parts prior to the final friction load measurements. During the running in period which can be arranged during the night for a 16-hour run, no operator is required, yet the machinery is fully protected. The slightest increase in friction load due to improper assembly of the machinery, breaking down of the lubrication, qualities of the oil, or any other cause, will result in immediate shut-down of the test beds. Since the control is actuated by a wattmeter and not by a current-sensitive relay, a small variation in voltage during the night or running-in period will not result in a shut-down.

The writer designed the layout of this equipment and was responsible for its installation in a plant engaged in the manufacture of heavy machinery. The control has met with great success in production testing at this plant and is in 24-hour service. The ease of operation, extreme accuracy, complete protection, and low installation cost are the chief advantages. Engineers seeing this installation have often commented that even if the control shuts down the test beds only once, the saving to the plant in avoiding damage to the machinery will more than pay for this control arrangement.

Scratch Hardness Test for Case Depth

Awarded a Fifth Prize in the Third Annual Instrumentation Contest.

By DONALD F. CLIFTON

Michigan College of Mining and Technology, Houghton, Mich.

IN testing materials it often is necessary to determine the variations in hardness of the specimens, especially in determining hardenability and in working with cases of different kinds. The conventional method of making these determinations is to take a series of hardness readings on a cross section of the specimen, using a Rockwell or similar hardness tester. This method is tedious, and because of the distance between impressions it is inaccurate—especially with thinner cases. It is practically useless with cases as thin as those on carburized and nitrided steel.

The instrument described herein was built to check visual measurement of the thickness of nitride cases by hardness readings. It has given reliable readings where the other type machine would not; and it has proved faster.

The surface preparation for scratch testing is necessarily greater than for single-indentation testing. A micro polish is required for accurate work, but for rougher work, such as hardenability determinations, finishing on a medium polishing belt seems to be satisfactory. Too little work has been done with the larger specimens to be sure of the finish required for different degrees of accuracy but all tests so far seem to indicate that greater speed is obtainable with specimens to 2" in diameter, and both speed and accuracy are increased with small specimens. With the nitrided specimens thirty-five were taken from a state satisfactory for testing on the Monotron, polished, etched, and hardness tests made in slightly over two hours, which is about the time it would have taken to run them on the

"I was born in Pella, Iowa, in 1917 and got my elementary and high-school education in Peoria and Hinsdale, Ill. I entered Antioch College in 1935 as a chemical engineering major and worked part time as an electrician. I had to leave school in the middle of my sophomore year due to illness. The next summer, while working, I decided to change my major to metallurgy so transferred to Michigan M&T instead of returning to Antioch. Graduated in 1940 (B.S. in Met. Eng.). I did research work on the nitriding of steel (which led to the development of the hardness tester) until December (after closing date of contest) when I went to work in the laboratory of the Globe Steel Tubes Co. in Milwaukee."

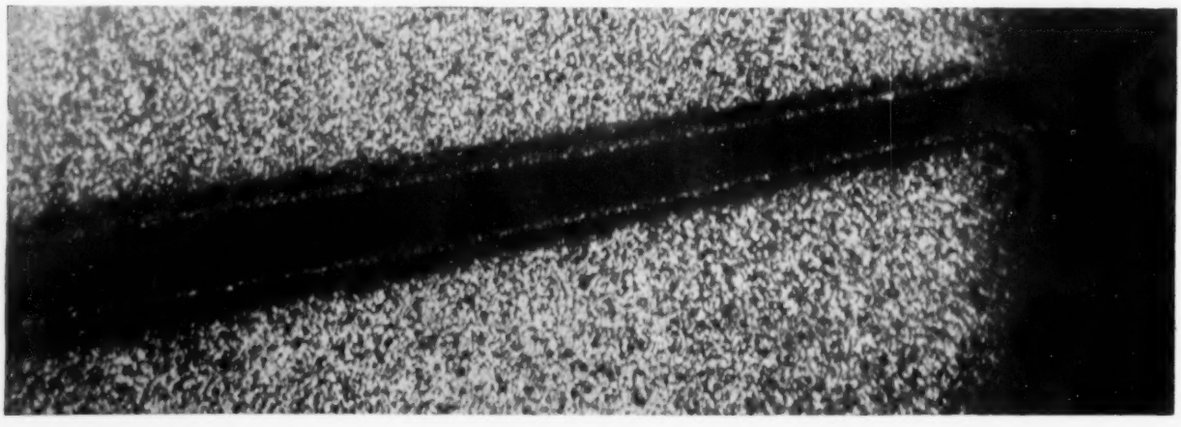
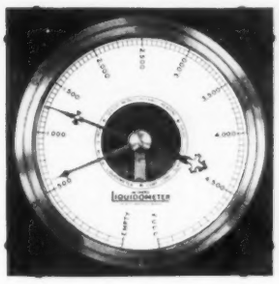


Fig. 1. 100 ×

Accurate TANK GAUGES for Every STORED LIQUID



LIQUIDOMETER remote reading tank gauges automatically indicate or record liquid levels. Direct reading models are available where remote reading is not required.

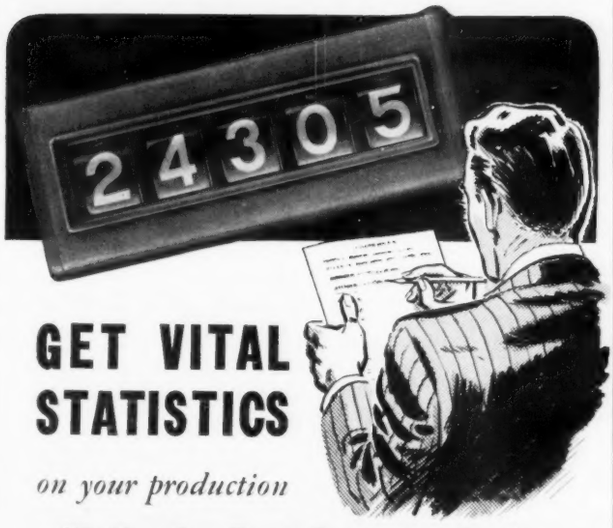
No pumps, valves or auxiliary units required to read levels. Balanced hydraulic transmission system completely compensates for temperature variations on communicating tubing. Accuracy unaffected by changes in specific gravity.

Approved for gauging hazardous liquids by Underwriters' Laboratories and other similar groups.

Write for complete details.

THE LIQUIDOMETER CORP.

36-27 SKILLMAN AVE. LONG ISLAND CITY, N. Y.



GET VITAL STATISTICS

on your production

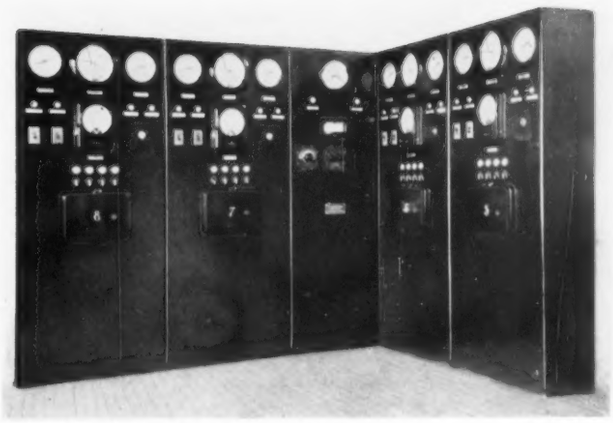
with Veeder-Root Counting Devices

You can get your production machines to put their work-records "down in black and white" . . . by the easy and inexpensive means of attaching Veeder-Root Counters. These accurate instruments record strokes, revolutions, pieces, starts, stops, speeds, lengths, volumes, light-flashes, or any other units. And these facts-in-figures will help you to put production schedules and costs under closest control. Let us show you how Veeder-Root Devices can *count you in on new savings.* WRITE

Veeder-Root Inc. . . . Hartford, Connecticut

Veeder-Root Inc.

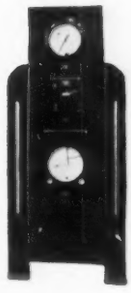
HARTFORD, CONNECTICUT



Fine Instruments deserve Fine Panelboards

The modern control room with its impressive array of recorders, controllers and indicators, has become a symbol of our technological age.

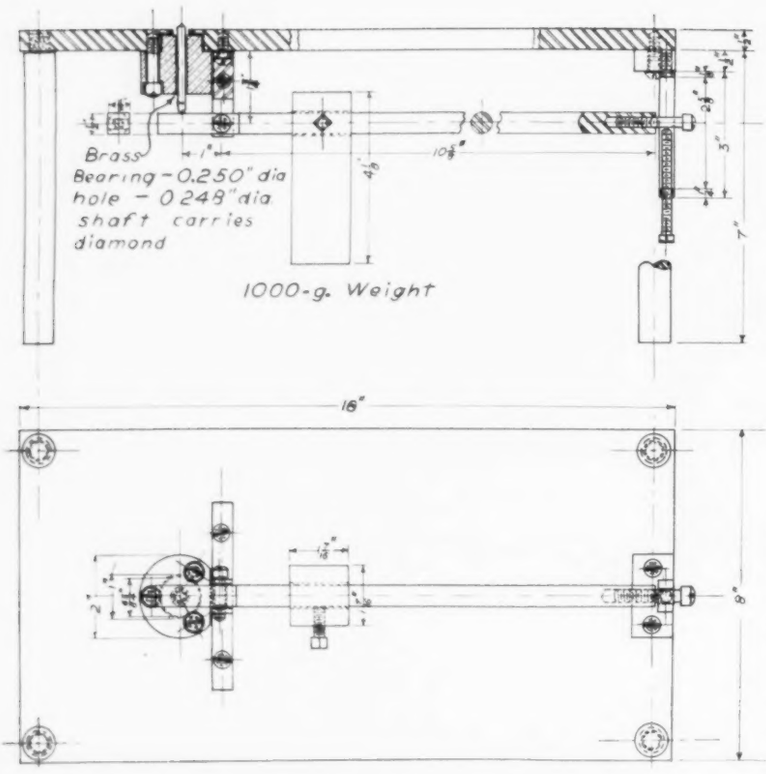
Proper thought must be given to the selection of the panelboard to insure correct design, rugged, precision construction, smooth, clean, surface appearance. Falstrom engineers, pioneers in fine panelboard production, are proud of the wide acceptance which has been received by Falstrom Instrument Panels and invite requests for assistance in planning your panelboards. Remember, your instruments have a complex and important job to do; mount them on Falstrom Panels.

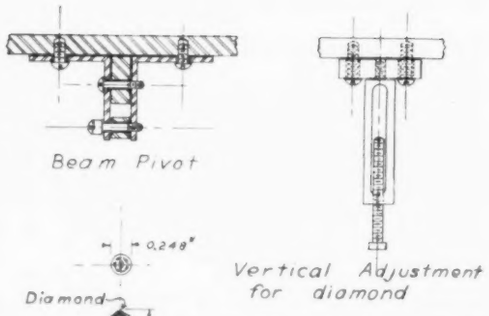


For Fine Panelboards

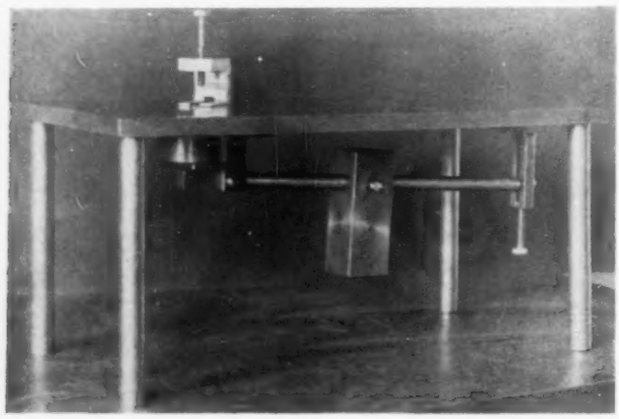
FALSTROM COMPANY

FALSTROM COURT, PASSAIC, NEW JERSEY





mond forms the cutting point. The shaft is hollow, the diamond protruding through a small hole in the upper end, and held in place by a rod extending through the shaft from the plug screwed into the lower end. The bottom of this plug is carefully rounded to reduce friction on the flat surface of the beam on which it rides. The entire mechanism of the tester is fastened to the under side of the ½" steel plate which forms the top of the table of the tester and through which the diamond extends. The top of this plate is polished to avoid unnecessary scratching of the specimens as they are pushed across the diamond. The legs are ¾" rods, and the assembly is heavy enough to be used without being fastened down.



The shaft carrying the diamond is 0.248" in diameter and slides in a 0.500" hole bored in the brass bearing. This bearing is 1⅜" long and is countersunk to within ⅛" of the top of the table. It is held in place by three bolts through the shoulder on the bearing, and tapped into the table top. No tapped holes in the table top extend through it.

The beam carrying the weight for loading the diamond is mounted on a frame made up of two pieces of steel angle with a block of steel fastened between them to keep the correct clearance between the arms so the beam will not bind. This assembly is bolted to the under side of the table just behind the bearing.

The beam itself is pivoted on a ¼" smooth shank bolt through a 17/64" hole in the beam, which is ½" square but turned round for 10¼" from one end for the round hole in the weight. The pivot of the beam is exactly one inch from the center of the diamond, so that with a 1-kg. weight 10" from the pivot a load of 10 kg. is obtained. This load is somewhat in excess of that needed for any specimen so far encountered, but the 1-kg. weight can easily be replaced by a smaller one for soft material. Having the correct load on the diamond is important in getting the best possible results.

The weight is of steel, 17/16" square and 4⅛" long. It has a hole for the beam to pass through, and a setscrew is tapped in from the side to hold it in any desired position.

At the rear end of the beam is an adjustment controlling the height of the diamond in relation to the table so that it can be raised to allow the use of a specimen holder and to allow for irregular surfaces. This adjustment consists of a bar with a vertical slot in which slides a bolt tapped into the end of the beam. Through a tapped hole in the bar a bolt extends up through the slot, limiting the distance the beam is free to drop. The slotted bar has a threaded lug at the upper end which screws into a tapped hole in a block. This block is bolted to the underside of the table so that the entire assembly can be readily removed, allowing the weight on the beam to be changed.

Most of the dimensions can be varied to suit the material at hand. The ratio of 1" to 10" on the beam has been found satisfactory not only because it allows ample variation in the load but also because the vertical movement allowed the diamond is sufficient without making the vertical adjustment overly long.

Monotron. By testing after polishing on fine metallographic paper, this time could have been reduced by perhaps 45 minutes with little effect on the accuracy obtained.

Fig. 1 shows the scratch on one of the specimens at 100×. This case has been ground through at an angle, so the apparent thickness is three times the actual thickness of 0.015". The point where the case begins and the scratch starts to narrow is not as clear in the picture as it appears on visual observation, but the rather rapid narrowing in the inner part with less decrease in width near the edge shows well the rather uniform hardness of the case near the surface of the piece, the decrease farther below the surface, and a final transition to the soft core material.

In thin-case specimens of this type it is possible to measure the case thickness with a micrometer eyepiece on the microscope, since the entire case is in the field. With hardenability specimens the inner edge of the case must be found and marked under the microscope and the depth of the hardened case measured with a ruler.

The hardness tester is quite simple; although it was built as a permanent addition to the testing laboratory it was made as simply and as cheaply as possible.

The diamond itself is a small jewel obtained from the local jeweler and is mounted in a steel shaft, as shown in the drawings. The sharp edge, not the vertex, of the dia-

POCKET SIZE

TRIPLETT

MODEL 670

Model 670 AC Ammeter is a handy little tester with wide uses in countless fields. A self-contained current transformer permits measurements on these ranges: 0-1; 0-2.5; 0-5; 0-10; 0-25. AC Amperes (for use on 60 cycles). Red Molded Case, with ivory panel.....

Dealer Net Price $9.00

The "Little Triplets" comprise a series of matched instruments available in single units or in combination to answer every servicing or electrical analyzing problem. These testers feature the large 3½" meter. Additional models are as follows:

Model 671—Five ranges: 0-5; 0-10; 0-25; 0-50; 0-100; 0-250; 0-500; 0-1000 AC Milliamperes.

Model 672—0-150; 0-300; 0-750 AC Volts.

Model 673—0-5; 0-10; 0-25; 0-50; 0-100; 0-250; 0-500; 0-1000 AC Volts (Rectifier type)

Model 674—0-1; 0-25; 0-5; 0-10; 0-25 DC Amperes.

Model 675—0-1; 0-5; 0-10; 0-25; 0-100; 0-250; 0-500; 0-1000 DC Milliamperes.

Model 676—0-50; 0-100; 0-250; 0-500; 0-1000 DC Microamperes.

Model 677—0-1; 0-2.5; 0-5; 0-10; 0-25; 0-50; 0-100; 0-250; 0-500; 0-1000; DC Volts at 1000 ohms per volt.

Model 678—Ohmmeter, self-contained batteries for 0-1000 Ohms (10 Ohms Center Scale); 0-10,000 (100 Ohms Center Scale); 0-100,000 Ohms; 0-1 Megohm; 0-10 Megohms.

Dealer Net Price .....Each $9.00

Write for Catalog
SECTION
321 HARMON AVENUE

TRIPLETT ELECTRICAL INSTRUMENT CO.
Bluffton, Ohio

INSTRUMENT DEPARTMENTS USE THE KESTER SOLDER-PRESCRIPTION SERVICE

Here is a sound approach to a basic problem—one that may be causing difficulty in your instrument work right now.

The problem is to find the right solder for each metal-joining operation.

This means the *solder alloy* must be right for the metals or alloys with which it unites; the *solder-flux* must be the right type, right strength and right amount to clean the work thoroughly without damaging it; and, finally, the *solder strand-size and core-size* must be conveniently proportioned for easy handling.

These four elements, *underscored* above, must be scientifically determined by someone who *knows the answers.* The men who operate the Kester Solder-Prescription Service are qualified. They draw on 44 years of soldering experience. At their disposal are:

100 DIFFERENT SOLDER ALLOYS
10 DIFFERENT SOLDER FLUXES
80 DIFFERENT SOLDER STRAND SIZES
4 DIFFERENT SOLDER CORE SIZES

The combinations are almost endless — so if you're after the *best possible* soldering results, let Kester prescribe the solders.

Mail a detailed description of your metal-working problems to the address below, and you will promptly receive your Kester Solder-Prescription.

You incur no obligation in making use of this service.

* The Symbol of Kester Solder-Prescription Service

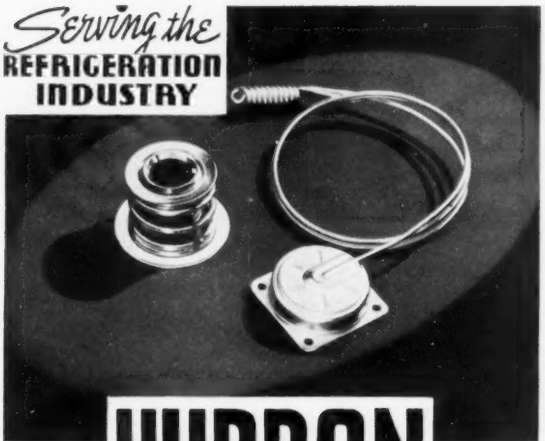
KESTER SOLDER COMPANY
4216 WRIGHTWOOD AVENUE, CHICAGO, ILLINOIS

Eastern Plant: Newark, N. J. Canadian Plant: Brantford, Ont.

KESTER CORED SOLDERS

STANDARD FOR INDUSTRY

Serving the REFRIGERATION INDUSTRY



HYDRON

METALLIC BELLOWS

produced hydraulically
BY

CLIFFORD MANUFACTURING CO.
564 E. FIRST STREET, BOSTON

BOSTON CHICAGO DETROIT LOS ANGELES

PRODUCERS OF BELLOWS EXCLUSIVELY
SERVING AUTOMATIC CONTROL MANUFACTURERS

COMPLETE ENGINEERING SERVICE

Speeding Up Gasoline Pipe Lines

Awarded a Fifth Prize in the Third Annual Instrumentation Contest.

By SELIG H. ISAACS

Instrument Engineer, Latonia Refining Corp., Covington, Kentucky

ADEQUATE supplies of gasoline and oil have become as important to armies and navies as ammunition and guns. Therefore, the equipment for moving refined products, in large volumes and without interruption, to their points of consumption has become as fundamental a necessity, in peace as well as in an emergency, as the actual production and refining.

For moving gasoline from refineries to central points for distribution, pipe-lines represent the fastest, most efficient and most dependable method of transportation. Some of the advantages of pipe-line handling as compared to tank car or tank truck movements are as follows:

1. Higher speed of transfer.
2. Elimination of loading and unloading labor.
3. Increased efficiency in: (a) lower power requirement per unit transferred; (b) elimination of the loss of some high octane number volatiles which always accompanies loading and unloading of tank cars and tank trucks.
4. Greater certainty of delivery.

It must be remembered in connection with Item 4 above that probably during a heavy armament program, and certainly in case of war, railroad and highway facilities will be taxed to the utmost. A system of handling large-volume gasoline movements separated totally from other transportation facilities would eliminate one of the most pressing problems that would confront those in charge of decisions on priority shipments.

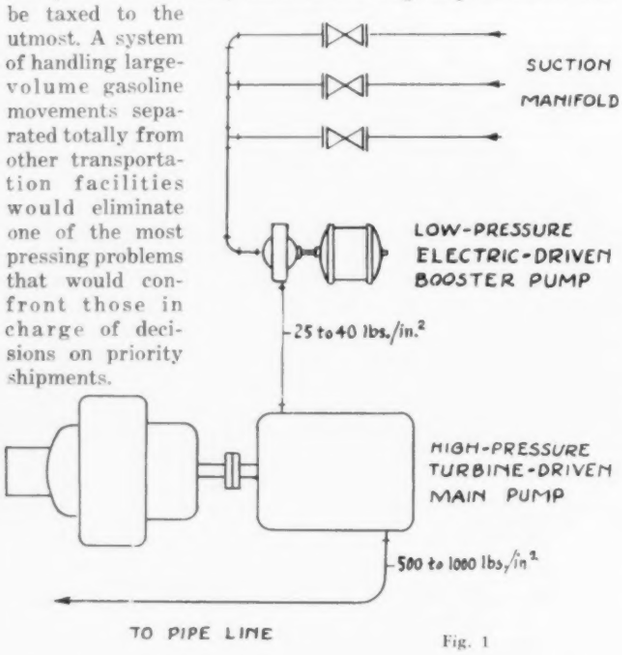


Fig. 1

It is a peculiar trait of pipe-line transportation that once a transfer has been started, no attention is required so long as operation is normal. But let some accident occur and in a few moments damage can be done that is not only costly but requires much time to repair. For these reasons large volume handling of gasoline by pipe-line was not found to be practical without proper instrumentation to control the pumping equipment. Pipe-line engineering therefore has become not only a problem of proper selection of pumps, valves, and pipes, but of automatically controlling the operation of the equipment so that in every way possible the line will be protected against damage.

Some of the operating troubles that can occur are as follows:

1. A broken line. Particularly serious when the line runs through heavily populated areas, as is often the case.
2. Accidental shutting of a valve at the receiving terminal while the transfer pumps are running, which of course can cause serious damage to the pumps.
3. Loss of suction by the pump. Serious when centrifugal pumps are used, which is normally the case.

There are other remote, but equally serious possibilities.

To protect and insure the continuous operation of its pipe line from the refinery to distributing points in Ohio the Latonia Refining Corp. has installed protective instrumentation which will be described.

Since he was graduated from the Dep't of Chemical Engineering of the University of Cincinnati in 1936, Mr. Isaacs has been with the Latonia Refinery of the Standard Oil Co. of Ohio, where for the past three years he has been in charge of Instrument Maintainance and Engineering. He was active in the organization of a Junior Chapter of the Engineers' Club of Cincinnati and served as president of that group during its first year of existence in the winter of 1938-39. He is registered as a Professional Chemical Engineer with the Ohio Board of Registration for Engineers.

Fig. 1 shows schematically the equipment in the refinery terminal of the line. An electric-driven single-stage low-head high-volume centrifugal pump pulls from any one of several tanks through a suction manifold and delivers gasoline to the main pump at a pressure of 25 to 40 lbs./in.^{2}. The main pump, a multiple-stage steam turbine-driven centrifugal, receives the material from the low-pressure pump and delivers at a pressure of 500 to 1000 lbs./in.^{2} depending on the rate of flow and the distance to the terminal to which delivery is being made. This main pump discharges directly to the pipe line.

Fig. 2 is a diagrammatic sketch of the control instrumentation. In this figure Item 1 is a 0 to 100 lbs./in.^{2} pressure recorder which measures the suction pressure to the main pump as produced by the single stage pump. Item 2 is a 0 to 1500 lbs./in.^{2} pressure recorder which measures the main pump discharge pressure. Item 3 is a recording orifice type flowmeter which measures the rate of flow of gasoline to the pipe line. These three instruments contain on-and-off air-operated control mechanisms connected in series so that the controlling (or diaphragm-motor) air pressure from Item 1 becomes supply pressure for Item 2, and the controlling air from Item 2 becomes supply pressure for Item 3.

Item 1 has a standard on-and-off control mechanism arranged so that when the pressure pen reads higher than the control point index, 15-lb. control air pressure is delivered to Item 2, and when the measured pressure is lower than the control point index, zero pressure is delivered to Item 2. Instruments 2 and 3, however, are equipped with *two* control point indices. These are so arranged that the pressure pen on Item 2 must stand between these two control point indices before the 15-lb. control air pressure is delivered by the instrument to Item 3. If the pressure-measuring pen is either above or below both control point indices, zero control air pressure is delivered. This is also true of the flow pen on Item 3, which must stand between its two control point indices before the full 15-lb. control pressure is transmitted to the remainder of the control air system.

All control point indicator arms are equipped with recording pens so that a record is kept of the control point settings.

From Item 3 the control air is connected to four separate diaphragm motors shown on Fig. 2 as Items 4, 5, 6 and 7. Diaphragm 4 operates a mercury switch so that when there is zero air pressure on the diaphragm the circuit is closed to a signal horn motor. Diaphragm 5 contains

a second mercury switch which energizes the starter switch holding coil of the electric-driven low-pressure pump when there is 15-lb. pressure on the diaphragm. Item 6 is a flat seated double-port valve in the steam line to the main pump turbine drive which is held open by 15-lb. pressure on its diaphragm. Item 7 is a single seated ¼" valve in the air supply line to the controllers, which is held open by 15-lb. on its diaphragm.

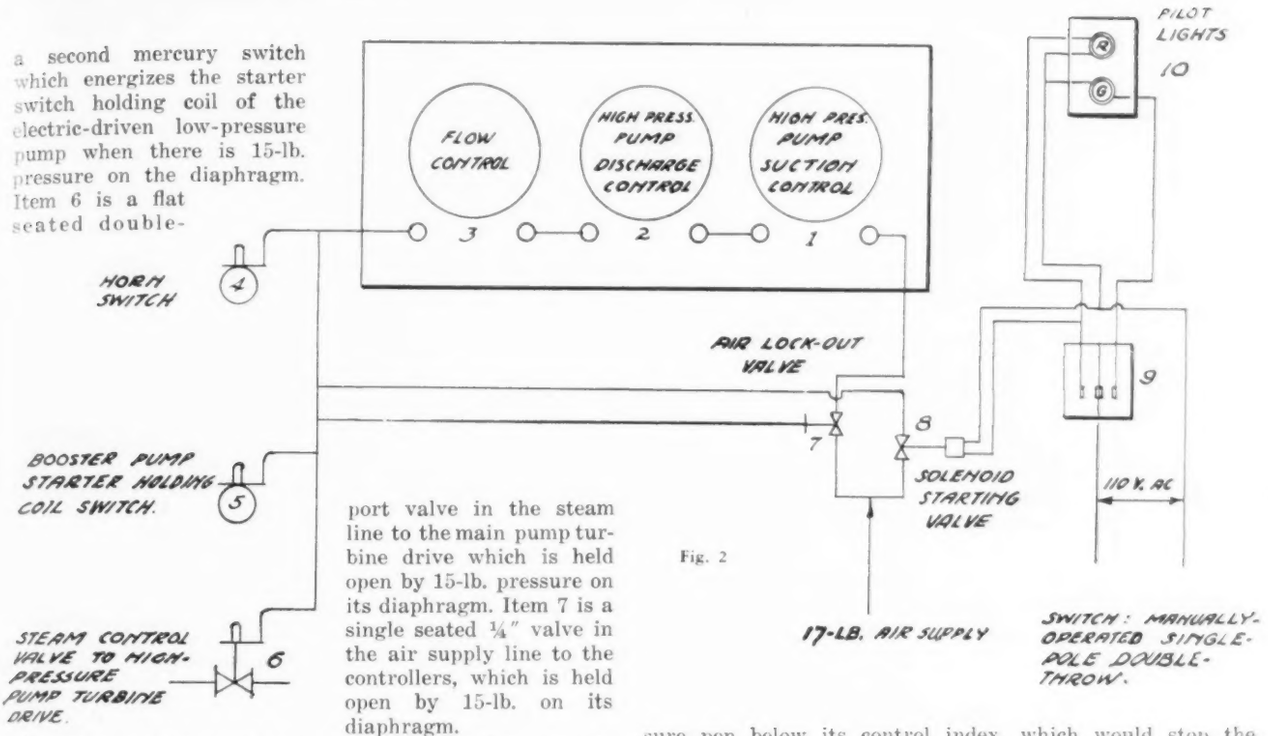


Fig. 2

In order to start pumping it is necessary to throw switch 9 to the position which lights the red light of the pilot light panel (Item 10) and closes the circuit to solenoid-operated air valve 8. Closing this circuit opens valve 8 and by-passes control air pressure around the controllers 1, 2 and 3. This shuts off the signal horn circuit at 4, energizes the starter holding coil at 5 and opens the turbine steam valve at 6. Under these conditions it is possible to start all the pumping equipment just as if there were no controls at all. As soon as the measured pressures on Items 1 and 2 and the flow on Item 3 have come to their normal operating values the control point indices are adjusted on the three controllers. On Item 1 the control point is set about 15 lbs./in.^{2} below the measured pressure. On Item 2 one control point index is set 100 lbs./in.^{2} below and the other 100 lbs./in.^{2} above the measured pressure. On Item 3 one control index is set about 10% below and the other about 10% above the flow. This means that the pressure pen on 1 is above its control point index; and the pressure pen on 2 and the flow pen on 3 are between their respective control point indices. This fulfills the conditions already described for causing each controller to deliver control air pressure at 15 lbs./in.^{2}. It is then possible to throw the switch at 9 so as to light the green pilot light at 10 and close valve 8. So long as the pressure pen on 1 remains above its control point index and the pressure pen on 2 and the flow pen on 3 remain between their respective control point indices there will be 15-lb. pressure on all the four diaphragms. Under these conditions both pumps will run and the horn will be silent. Should any one of these conditions no longer hold true, air will be released from the diaphragms. This would shut down both pumps, sound the horn and close the air lock-out valve 7. It is then impossible for the controls to function and permit operation of the pumps until the operator manually throws the switch at 9 to open the control air by-pass.

It is now possible to return to the list of possible pipe-line accidents previously presented and analyze how the control system would react to each.

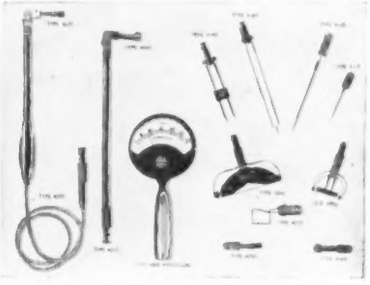
1. A line break would cause a pressure drop at the pump which would be sufficient to move the pressure pen of Item 2 below its low control point index, which would shut down the pump.

2. A valve shut against the running pump would stop the flow and cause the control to operate from the flow instrument.

3. Loss of suction would be indicated by a pressure drop, on the low-pressure controller, sufficient to move the pressure pen below its control index, which would stop the pumps.

Because of this control unit it is possible to operate a high-pressure pipe-line with safety to equipment, operating personnel, and communities through which the line may run. At the same time a minimum of attention is required. The Gasoline Pipe-line thus becomes a completely practical unit and can take its important place in the scheme of peacetime operations and National Defense.

The Improved "Alnor" PYROCON



for surface temperatures

The Alnor Pyrocon which has had such wide acceptance for every type of application now offers many new and exclusive features.

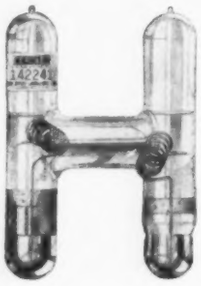
1. Unusually heavy and rugged movement—highly essential in a portable pyrometer.
2. Choice of either rigid or flexible arms or both which are instantly removable and interchangeable.
3. Improved and enlarged assortment of thermo-couples all of which are instantly interchangeable without change in instrument calibration.
4. Choice of seven standard temperature ranges.
5. Greater accuracy. Yoke of arms and side plates of thermo-couple assembly made of thermo-couple material to eliminate junction errors.

Regardless of your application the Alnor Pyrocon will prove the most economical. **Write for folder No. 3511**

Illinois Testing Laboratories Inc.

142 W. Hubbard St. Chicago, Ill.

EPPLEY STANDARD CELLS
for
INDUSTRIAL USE

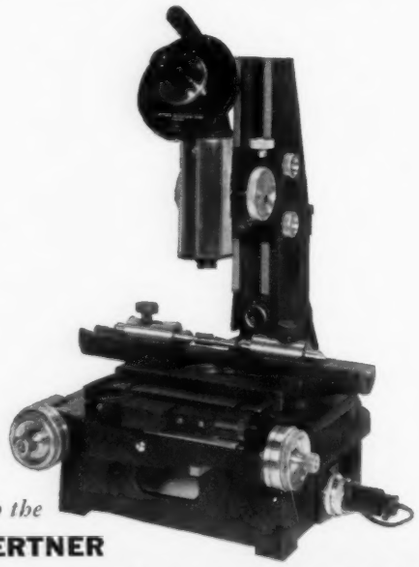


For more than 20 years the leading American manufacturers of industrial temperature control apparatus have used Eppley Standard Cells in their recorders, pyrometers and other instruments utilizing the potentiometric system of measurement.

When purchasing one of these instruments, make sure that the standard cell it contains is an Eppley cell.

EPLAB
THE EPPLEY LABORATORY, INC.
SCIENTIFIC INSTRUMENTS
NEWPORT, R.I.
U.S.A.

Increase . . . **PRODUCTION**
Speed-Up . . . **MEASUREMENT**



With the
GAERTNER
TOOLMAKER MICROSCOPE
Descriptive Bulletin on Request
THE GAERTNER-SCIENTIFIC CORP.
1211 Wrightwood Ave., Chicago, U.S.A.

Rapid Method of Determining Case Depth

(Concluded from page 8)

Cyanide case hardening Material used: S. A. E. 101
3/32″ thick—heated to 1475° F.—quenched in oil

Thickness of case in inches	*Penetor surface reading*
Annealed	37
0.0015	65
0.0025	70
0.003	74

Note the extreme sensitivity of the Penetor to small dimensional differences in case thickness.

Liquid carburizing Material used: S. A. E. 1112
¼″ thick—heated to 1540° F.—quenched in oil

Thickness of case in inches	*Penetor surface reading*	*Penetor depth reading*
Annealed	35	..
0.002	59	..
0.005	74	39
0.015	87	52
0.025	88	62

After a certain saturation of the surface by carbon a deeper penetration of magnetic flux is necessary to indicate case depth and consequently it is advisable to use the Penetor depth reading for measuring thicker cases. Similar results are obtained with all other forms of carburizing.

Detection of under and over heat on cyanide case hardened parts Material used: S. A. E. 1015
3/32″ thick—depth of case 0.003″

Quenched in oil at	*Penetor surface reading*
1400° F.	72
1525° F.	76
1600° F.	87

Hardening and tempering of high-speed steels

	Penetor surface reading	*Penetor depth reading*
Heated to 2300° F. quenched in oil	85	85
Tempered at 1050° F.—3 hrs.	72	58
Same sample as above held at quenching heat too long	90	

This table illustrates a great difference in Penetor readings for tempering heat, which is not as prominently indicated by identation test methods. Also note the increase in Penetor readings due to soaking H.S.S. too long. This error is known to result in coarse carbide network and brittleness.

Hardening and tempering of spring steel
Material used: 80 carbon spring steel 0.006″ thick

	Penetor depth reading
Annealed	18
Heated to 1475° quenched in oil	91
Tempered at 250° F.	87
300° F.	85
350° F.	81
400° F.	75
500° F.	45
600° F.	34

The sudden drop in Penetor readings between the 400° F. and 500° F. temperatures is also evident in some physical tests. A continuous test of rolls of spring steel may be taken automatically.

SURFACE DECARBURIZATION OF TOOL STEELS

Many tool failures are directly traceable to the insufficient removal of surface stock of tool steel before hardening. The Penetor is invaluable in determining this variable amount; decarburized stock is removed until the surface reading corresponds to the core reading.

CONCLUSION

The Penetor, which has been described, will contribute appreciably to the flawless production of aircraft motors and other Ordnance supplies and should be a welcome addition to instruments which play such an important rôle in speeding up our National Defense.

INDUSTRIAL INSTRUMENT SERVICE
CLAUD S. GORDON CO., Cleveland—Chicago—Indianapolis

FUSES
LITTELFUSES are plus accurate. They protect! For instruments, meters, radio, aircraft, auto. High voltage fuses. Neon testers and indicators. Fuse mountings, all types. Write for catalog.
Littelfuse Inc., 4759 Ravenswood Ave., Chicago, Ill.

HAYS IS THE *original* DRY TYPE DRAFT GAGE

ALL other diaphragm type gages are imitators of Hays original Colon-leather diaphragm draft gage. Hays must have something "on the ball" to be thus imitated—and to be the largest selling draft gage on the market. Standard with the U. S. Navy also. Publication 40-294 will bring you complete information. Send for it today.

The HAYS CORPORATION
SINCE 1907 — COMBUSTION INSTRUMENTS AND CONTROL — MICHIGAN CITY, INDIANA, U.S.A.

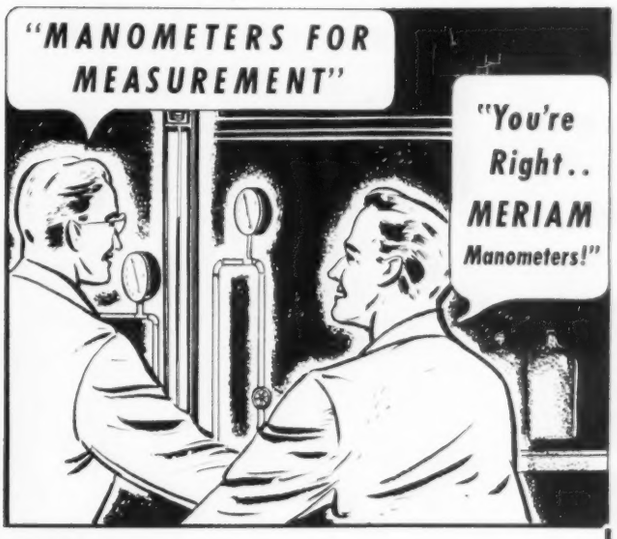
Prizes, totaling $175.00, are offered for the best suggested applications of Wheelco's new Remote Controllers.

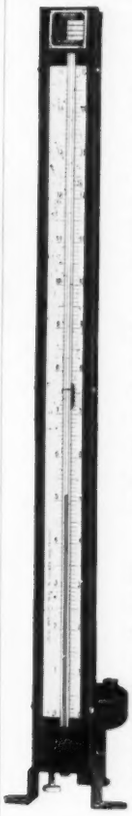
These Controllers, employing the famous "Radio Principle", are readily adaptable for practically any application where control is essential.

Send us your suggestions for using these Controllers. Entry blank, contest rules and complete data on the Wheelco Remote Controller will be sent immediately on request. WRITE TODAY!

Contest closes MARCH 31, 1941

Wheelco Instruments Co.
1929-33 S. HALSTED STREET • • • CHICAGO, ILLINOIS





THE *direct reading* Well Type Manometer illustrated is one of several types of Meriam Manometers which promote efficient production due to the accuracy of their measurements. Thousands of these manometers are being used in scores of industries to measure pressures, vacuums, and differential pressures.

There is a Meriam Well Type for practically every operating requirement. They are available in a wide range of models and sizes—5 different standard scale graduations and 4 mounting styles. (The Table Mounting style shown is ideal for portable or laboratory use.)

These manometers are backed by Meriam's 30 years of experience in the instrument field. They are permanently accurate because they have no moving parts to wear out. Extra ruggedly constructed, with steel channel body, steel end blocks, and Pyrex gland-packed tubing. Convenient features include an external zero scale adjustment.

WRITE FOR THIS BULLETIN ON WELL-TYPE MANOMETERS

IT'S **FREE!**

The full, illustrated story on these valuable instruments: operation, installation, features, etc. Ask for Bulletin B.

THE MERIAM Co.
Instruments for Indicating Pressure or Flow of Liquids and Gases
CLEVELAND • OHIO
Representatives in Principal Cities

Thermometers
Hygrometers
Psychrometers
Hydrometers

Several hundred types and varieties of instruments are described in new Catalog 110, but since ALL of them are produced in our own factory under our own experts' supervision, the best materials and high-grade workmanship characterize EACH of them.

Our customers find special satisfaction in the choice of FOUR different styles of thermometer glass: 1. White enamel back; 2. yellow enamel back; 3. Hespe; 4. red-reading mercury.

TWO WIDELY USEFUL NUMBERS

(Left) No. 169. For pressure-cooking processes, with two scales: 170-270°F. and 0-30 lbs. pressure. 9" scale length. (Right) No. 326. Max. & min. registering thermometer in 12" shelter type copper case. Approx. range minus 40 to 120°F.

Weksler Thermometer Corporation
535 PEARL STREET NEW YORK, N. Y.

Positions Vacant

(A) PLANT SUPERINTENDENT

(B) CHIEF ENGINEER

Large, well-known organization in New York area is expanding its activities in the field of aircraft instruments, industrial instruments and control equipment. Excellent opportunities for two executives who have proven ability. Applicants must be prepared to accept responsibility for engineering and manufacture of present products and a general development program. All replies confidential. Give complete information. Box 54, Instruments Publishing Co., 1117 Wolfendale St., Pittsburgh, Pa.

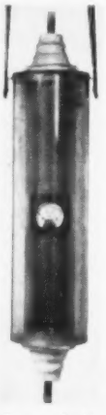
NEW INSTRUMENTS

Dial Test Indicator

New "GS" Dial Test Indicator is characterized by a simplified lever movement. Instead of the usual rotating multiple gear and pinion trains, the GS indicator utilizes a lever arm. It is said to be constructed on the principle that "the simpler the mechanism the greater will be the accuracy and durability of the tool." Dial is graduated in 1/1000" with a plunger travel of 3/16". Indicator can be supplied with universal ball joint back which permits a wide range of indicator settings on all types of machines. Indicator movement is mounted between separate top and bottom plates; and hair spring is mounted between two flat plates and cannot interfere with the lever rack. Plunger is hardened and ground and has nickel-silver bearing.—*George Scherr Co., 128 Lafayette St., New York City.*

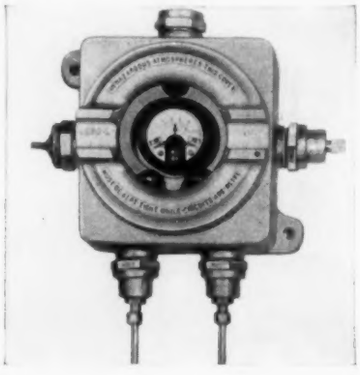
Phasing-out Voltmeter

New portable high-resistance voltmeter for approximate indications of kilovoltage has been developed for higher voltages (up to 15 kv.) than those now handled by the maker's similar 5-kv. voltmeter (*Instruments*, Dec. 1938, page 292). Designed particularly for phasing-out power distribution circuits, new instrument is also suitable for bus sectionalization, location of cable faults, and similar applications. New voltmeter is for use on 6900- and 12,000-volt circuits. It has a scale marked 0-15 kv., and is constructed to withstand 30 kv. momentarily since this voltage may be experienced when phasing out 15-kv. circuits. When used for phasing-out service, the instrument will show approximately zero voltage if the correct phase relationship is obtained, or will go off-scale, indicating an improper connection. Basically, it consists of a miniature instrument connected in series with a ¼-watt neon lamp and two high-voltage resistors.—*General Electric Co., Schenectady, N. Y.*



Explosion-proof Gas Alarm

New M.S.A. Explosion-proof Combustible Gas Alarm is for safely and continuously sampling atmospheres where combustible gases and vapors may be present. It provides instant warning when gas concentrations exceed a predetermined limit, and may be adapted for automatic process or ventilation control. New unit, including sampling pump, is contained in an Underwriters-approved explosion-proof condulet, and can be safely installed in gaseous atmospheres, obviating the need for long sampling lines. Instrument is specifically calibrated for the particular gas or vapor which it will test. Operator can adjust the measuring circuit to operate a warning signal at any predetermined point within instrument's range.—*Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh, Pa.*

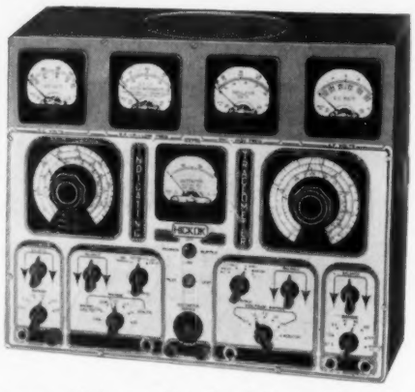


Computing Device for Electrical Work

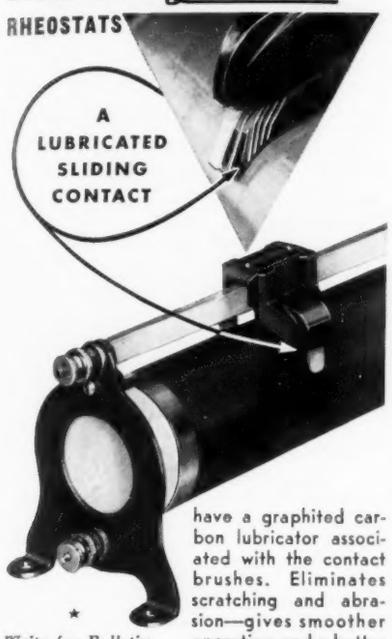
"Ohm's Law Calculator" is said to give the answer to any Ohm's Law problem with one setting of the slide. All values are direct-reading. Calculator does not require that user have knowledge of a slide rule. It has scales on both sides so as to cover the range of currents, resistances, wattages and voltages commonly used in the industrial, electronic, and radio fields. Calculator is available to engineers, laboratory men, production managers, maintenance men, purchasing agents, etc. who write to maker, on company letterhead, giving name and position. (Ten cents must be enclosed to cover handling costs.) — *Ohmite Mfg. Co., 4835 Flournoy St., Chicago, Ill.*

New Model "Traceometer"

Improvements embodied in new "Model 155" of "Traceometer" (see *Instruments*, Jan. 1940, page 26) include addition of a self-contained speaker internally connected for monitoring either r-f., i-f. or a-f. channels. It gives continuous measurement of voltages and traces the signal in any five circuits at one time without interfering with performance of the set being tested. Vacuum-tube voltmeter circuits are so arranged that accidental overvoltage cannot damage indicating instruments. All measurements are made without disturbing normal operation of circuit under test. New Traceometer is for rapid servicing for f-m., a-m. and television receivers.—*The Hickok Electrical Instrument Co., 10329 Dupont Ave., Cleveland, Ohio.*



JAGABI *"Lubri-tact"* RHEOSTATS

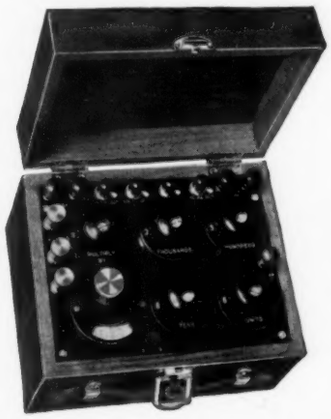


have a graphited carbon lubricator associated with the contact brushes. Eliminates scratching and abrasion—gives smoother operation and a better contact. Makes Jagabi Rheostats *better* rheostats.

Write for Bulletin 1620-I which lists new lower prices.

JAMES G. BIDDLE CO.
Electrical Instruments
1211-13 Arch Street Philadelphia, Pa.

PORTABLE WHEATSTONE BRIDGE



A high grade instrument for measuring resistances from a fraction of an ohm to 10 megohms. Contains a 4-dial rheostat, ratio dial, galvanometer and battery, all enclosed in a substantial walnut case. Nine coils per dial. Accuracy .1%. Built to endure.

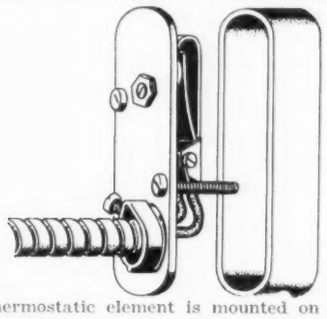
Cat. No. 1050—Portable Wheatstone Bridge with Murray and Varley Loops. . .$110.00
Cat. No. 1052—Portable Wheatstone Bridge without Murray and Varley Loops.$90.00

Send for Bulletin No. 105

RUBICON COMPANY
Electrical Instrument Makers
29 North 6th St. Philadelphia, Pa.

Surface Thermostat

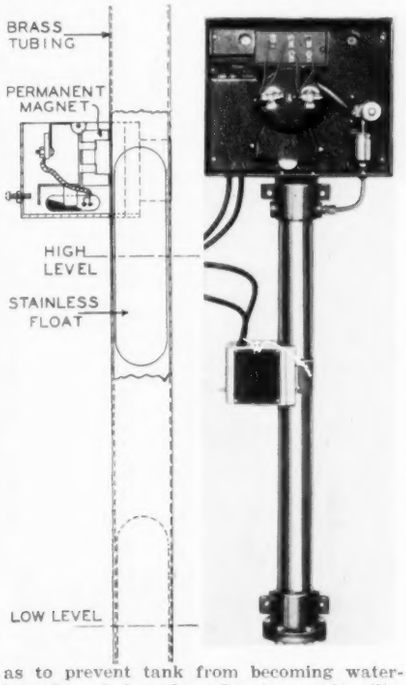
New "BX Strip Type Thermostat" is of heavy-duty design, comprising a thermostatic element suitable for electrical heater loads of 1500 watts at 115-230 volts a.c.



Thermostatic element is mounted on a removable cover to facilitate wiring. A ⅞" hole is provided in cover for BX cable connector, and two 10-32 mounting screws fasten both cover and base to any flat surface. Available in max. temperature ranges of 300°, 450°, and 700° F. Supplied with normally-closed contacts to open with rise in temperature; or with normally open contacts to close with rise in temp.; both being adjustable. Dimensions $4\frac{1}{4}" \times 1\frac{5}{8}" \times 1"$.—*George Ulanet Co., 86 E. Kinney St., Newark, N. J.*

Combined Liquid Level and Pressure Controller

Though available separately, new "PW" and "PWD" controllers have been developed in response to demand for simple fool-proof system of controlling water level and air volume in pressure tanks in such manner



as to prevent tank from becoming water-logged or air-bound; and as to permit utilizing tank's maximum capacity. At left is illustrated "PW" float column control alone; at right, combination of "PW" and "PWD" —latter shown with cover removed. Pressure element is identical with maker's "Roto-Trol," is of the springless, ball-bearing type. New level controller, available by itself, has a stainless-steel float and packless magnetic coupling utilizing an Alnico alloy magnet. Manufacturers emphasize that new controllers are particularly suitable, in their cycles of operation, for control of centrifugal pumps, deep well pumps, etc.—*Water Level Controls Co., 2255 University Ave., St. Paul, Minn.*

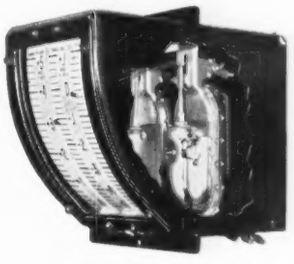
BAILEY METERS

METERS and CONTROL *for Boiler Room Service . . .*

Boiler Meters Reduce fuel costs, lessen maintenance and outage, lower standby costs, and add capacity. They indicate, record and integrate Steam Flow from the boiler, record Air Flow supplied for combustion and record Flue Gas Temperature.

Bailey Boiler Meter

Multi-Pointer Gages for indicating drafts, pressures, differentials are available with any number of pointers from one to twelve. They are actuated by sturdy yet sensitive diaphragm units.



Multi-Pointer Gage

Flow Meters. For indicating, recording and integrating the flow of steam, feed water, compressed air and other fluids.

Coal Meter

Granular Material Meters For accurately measuring the flow of coal or other granular materials in gravity chutes from overhead bunkers. The total quantity of granular material is shown on a large illuminated counter which may be easily read at a distance of 50 feet.

Control Systems Make possible the every-day operation of equipment for steam generation and utilization at test efficiencies. They are applied to the control of combustion, feed water, superheat, desuperheat and other factors.

Complete Information on any of the above Bailey products will be gladly furnished upon request.

G-14

BAILEY METER • COMPANY •
1041 Ivanhoe Rd., Cleveland, Ohio
BAILEY METER COMPANY LTD., MONTREAL

Prepublication Offer

TEMPERATURE

Its Measurement and Control In Science and Industry

THE PAPERS of the Symposium sponsored by the American Institute of Physics, with the cooperation of the National Bureau of Standards, National Research Council and a large group of officers and committees of many American scientific and technical societies, with the following purposes in view:

1. coordination of the treatment of the subject of temperature in the several branches of science and engineering,
2. review of fundamental principles and a recapitulation of recent progress,
3. accumulation of contributions for a comprehensive text to be published after the Symposium,
4. improvement of technical curricula by making the latest information available.

Fundamental knowledge in the field of temperature and its measurement is exhaustively covered in this encyclopedia volume. The collection of 125 papers by eminent engineers, metallurgists, physicists, physicians and biologists, presents thorough-going decriptions of all phases of temperature technique, and profound theoretical treatment of the thermodynamics and physics which underlie the various temperature scales.

The scope of this volume is all-inclusive, ranging from the closest possible approach to absolute zero to the temperature of the stars; from the production and loss of heat in the body to measuring the temperature of volcanoes. Innumerable methods of precision pyrometry are described in detail. Low-temperature cancer therapy, cooling of massive concrete structures, temperature conditions in oil-well drilling, artificial fever, high-temperature arcs, molten steel pyrometry—these and many more subjects of compelling interest make this an essential reference work for laboratories and libraries, as well as for all who are engaged in any phase of temperature work.

Detailed Circular Mailed on Request

Cloth 1400 pages 550 illustrations

List Price February 1, 1941 **$11.00**
Prepublication Price **9.00**
Order Now and Save **2.00**

Reinhold Publishing Corporation

330 West 42nd Street New York, N. Y.

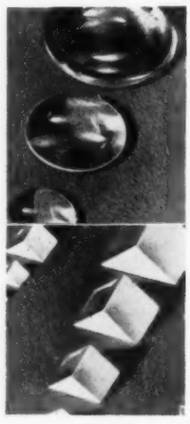
BAUSCH & LOMB SPECIAL OPTICAL PARTS

If your research requires special optical parts for experimental instruments, the Bausch & Lomb booklet, "Lenses, Prisms, Mirrors," will furnish you with invaluable data on all available types of optical parts. Listed therein are numerous items of glass, calcite and quartz with their focal lengths, dimensions, tolerances and prices. All are made to Bausch & Lomb high standards of accuracy. Operating its own glass plant, Bausch & Lomb exercises complete control from raw material to finished product.

A copy of the booklet will be sent free on request. Write to Bausch & Lomb Optical Co., 615 St. Paul St., Rochester, N. Y.

BAUSCH & LOMB OPTICAL COMPANY

FOR YOUR EYES, INSIST ON BAUSCH & LOMB EYEWEAR, MADE FROM BAUSCH & LOMB GLASS TO BAUSCH & LOMB HIGH STANDARDS OF PRECISION



ADVERTISERS IN PART ONE

American Electrical Sales Co., Inc. A8
Bailey Meter Company 27
Bausch & Lomb Optical Company 28
Bendix Aviation Corp., Marine Div. A2
Biddle Company, James G. 27
Bristol Company, The ..... Back Cover
Brown Instrument Company A3
Clifford Manufacturing Company 21
Cochrane Corporation A7
Continental Electric Company A8
Coxhead Corp., Ralph C. A8
Electric Tachometer Corporation A8
Electrical Research Products, Inc. A7
Engel, Inc., H. C. M. A8
Engelhard, Inc., Charles A8
Eppley Laboratory, Inc. 24
Falstrom Company 19
Foxboro Company ..... Inside back cover
Gaertner Scientific Corporation 24
General Electric Company 13
General Radio Company A5
Gordon Company, Claud S. 24
Hays Corporation, The 25
Heise Bourdon Tube Laboratories A4
Illinois Testing Laboratories, Inc. 23
Johnson Service Company 17
Kester Solder Company 21
Leeds & Northrup Company A6
Lewyt Metal Products Co., Inc. A4
Liquidometer Corporation, The 19
Littelfuse, Incorporated 24
Meriam Company, The 25
Minneapolis-Honeywell Regulator Co. A3
Moeller Instrument Company A2
National Electric Controller Co. A8
Philadelphia Thermometer Company A7
Rawson Electric Instrument Co. A8
Reinhold Publishing Corporation 28
Rubicon Company 27
Shallcross Manufacturing Company 17
Shore Instrument & Mfg. Company A8
Sola Electric Company A7
Tagliabue Mfg. Co., C. J. ..... Inside front cover
Taylor Instrument Companies 9
Triplett Electrical Instrument Co. 21
Veeder-Root, Inc. 19
Ward Leonard Electric Company 7
Weksler Thermometer Corporation 26
Weston Electrical Instrument Corp. A1
Wheelco Instruments Company 25

Available...

Design and development engineer for industrial instruments, recorders, indicators, automatic controllers, valves, engineering specialties, precision mechanisms, patents. Originator of a number of nationally known products. Box 132, Instruments Publishing Co., 1117 Wolfendale St., Pittsburgh, Pa.

SPECIAL ISSUE OF *Instruments* THE MAGAZINE OF MEASUREMENT and CONTROL

Vol. 14, No. 1
January, 1941
Price $2.00
In Two Parts

PART TWO—THE 1941 INSTRUMENTS INDEX

More Than a Directory

CONTAINING the answers to 99% of the inquiries which *Instruments* receives from subscribers, this Supplement may be likened to a set of phonograph records: it can only be "played" by a "pick-up." The simple "pick-up," which will place at your instant command a wealth of information, is merely your getting acquainted with this Supplement by READING THIS PAGE.

The Index Section—"Who makes what"—is the most important. Anyone who wants to know where he can buy or secure information on a certain product will find the product properly indexed and cross-indexed, and under it the names of the manufacturers and sole representatives.

Indexing System. Products are indexed under the main word. In cases where a name is ambiguous, or where the item is known under two or more names, companies making such devices are listed under one heading and cross-references inserted under the other headings.

Specific Terms. You never are in need of "a gage" but of some particular kind of gage. Therefore we do not list manufacturers under broad general designations. For example, we do not list any names under the main heading "Meters" but we give the sources of supply for numerous classes and types of meters. Moreover, we do not list any names under "Meters, Liquid" alone, but we give under proper subheads the sources of supply for the *class* and *type* of liquid meter you may need.

Trade Names. An effort has been made to remove all proprietary trade names from the Index Section.

Correctness of Headings. As explained above, main headings and subheads are technically correct. A few are not scientifically correct: they are names in common usage, recognized for the convenience of the majority.

Correctness of Listings. We have endeavored to list no firm names under specific headings unless the instruments made by such firms belong there by virtue of their design and construction.

For example, instruments called "colorimeters" but which cannot yield color specifications, belong under Color Comparators, Color Matchers, etc.

Also, an instrument called the "Integrating ————" or "Totalizing ————" may be nothing but a counting type, belonging under the subhead "Counting."

This we have done in relatively few cases, for it amounts to *censoring* the data sent to us. As a rule, we had to take the company's word that it could supply the product in question. We can't send "detectives" to a thousand plants!

Completeness. More than 1200 manufacturers were canvassed in the last four months. Those that did not answer our first letter after one month received a second one. Again, a third letter was sent to nonresponders at the end of the second month. In the last few weeks we even sent representatives to call on manufacturers. Therefore, the omission of any manufacturer's name under any heading is due to the negligence of someone in his own organization.

CONTENTS

1. *Index to Instruments and Apparatus.* **In this section, products are listed alphabetically. Under each heading appear the names of the manufacturers of this equipment (and of the sole representatives of such manufacturers).** *Pages 2-65.*

2. *List of the Laboratory Supply Houses.* **Under the heading "Apparatus, Laboratory," on page 5, are listed companies specializing in laboratory supplies, equipment, instruments and apparatus.**

3. *Directory of Manufacturers and sole representatives,* **with complete addresses and brief descriptions.** *Pages 66-75.*

Every effort has been made to restrict the names in the Index Section to (1) the actual manufacturers and (2) the sole authorized sales agencies. On the other hand, whenever you desire to order at one time a variety of equipment, made by different firms, you may find it most convenient to get in touch with a recognized, competent, "laboratory supply house." These houses are listed under "*Apparatus, Laboratory,*" on page 3.

Instruments' Further Service. This Index contains the answers to *only* 99% of your inquiries. If you cannot find the product or the name you want, communicate with the Information Section, Instruments Publishing Co., 1117 Wolfendale St., Pittsburgh, and every effort will be made to furnish the information promptly.

Suggestions. We shall appreciate suggestions regarding:

1. Headings not at present found in this Index which should be there,
2. Firms listed erroneously, and
3. Other inaccuracies which may have crept in despite all precautions.

Published Monthly on the 15th by

The Instruments Publishing Company
1117 Wolfendale Street Pittsburgh, Pa.

R. RIMBACH Managing Editor
M. F. BEHAR Editor

Annual Subscription: U. S. $2.00. All other countries $3.00 *payable in advance* (remit by New York draft). Copyright 1941 by The Instruments Publishing Company. Entered as second-class matter January 26, 1932, at the post office at Pittsburgh, Pa., under the Act of March 3, 1879.

BRANCH OFFICES

Boston: James Condon, 36 Myrtle St. (Lafayette 0829). *New York*: R. K. Farnham, 56 W. 45th St., Room 1105 (Murray Hill 2-8763). *Chicago*: William Farnham, 201 N. Wells St. (Andover 4180). *Cincinnati*: Harold W. Haskett, Keith Bldg. (Parkway 7639).

ONLY

RIEHLE

UNIVERSAL HYDRAULIC

offers you ALL these desirable features

PENDULUM INDICATOR *unexcelled for accuracy, simplicity and ruggedness.*

ORIGINAL ACCURACY *maintained throughout service life of machine. No springs.*

5 SCALE RANGES *on pendulum indicator---at no extra cost.*

345 INCH (28 feet) INDICATING SCALE.

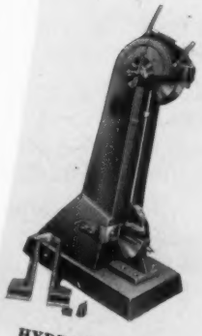
CONSTANT SPEED *regardless of load or temperature of oil.*

ONLY 1 HANDWHEEL. *Single turn changes from highest speed forward to highest speed reverse.*

These new Riehle Universal Hydraulic Testing Machines embody the most advanced hydraulic measuring and loading system. Ideal for both production or routine tests as well as the finest research work. Get the FACTS—send in the coupon below!

RIEHLE TESTING MACHINE DIV.
American Machine and Metals Inc.
East Moline, Illinois

INVESTIGATE THESE OTHER RIEHLE PRECISION TESTING MACHINES



COMBINATION IMPACT TESTER

Makes Izod, Charpy and Tension Tests. Changes from Izod to Charpy in one minute's time. 110-220 ft. capacities.

HYDRAULIC BRINELL MACHINE

Full load quickly applied by only two turns of handwheel. Simple. Accurate. Accumulator type load indicator---no springs.

FILL IN . . . MAIL TODAY:

RIEHLE TESTING MACHINE DIV.
102 Riehle St.
East Moline, Illinois

YES Send me latest FACTS on Riehle Universal Hydraulic. Also literature on: Riehle Impact Tester ☐, Riehle Brinell Machine ☐

Name .....

Address .....

City ..... State .....

Why pay more when... DeJUR DEPENDABILITY IS TOPS IN METERS?

AMONG discriminating engineers, two facts about meters are rapidly becoming universally recognized. *First* . . . DeJur-Amsco, comparative newcomer—but an oldtimer in the field of precision instruments—designs meters to standards of unquestioned dependability. *Second* . . . DeJur quality meters cost considerably less.

No fly-by-night is DeJur dependability. It's lasting, because it's been doubly proven! First, through years of painstaking laboratory-simulated field conditions. And second, by the experience *gained* through two and a half decades of radio component precision production. Rarely will any meter be called upon to meet in actual service the endurance tests . . . the accuracy tests that DeJur engineers apply.

If dependability is your first consideration in meters, specify DeJur and be sure. Complete stocks on hand and prompt delivery is your assurance of satisfactory service. Today, when you specify DeJur, you get dependability that's tops in meters, at lower meter prices. This is an extra dividend DeJur-Amsco customers enjoy.

Write for complete information.

DeJUR-AMSCO CORPORATION

SHELTON, CONNECTICUT

"TO BE SURE BUY" DeJUR AMERICAN

RCA Measuring Equipment

for industrial applications

CATHODE RAY OSCILLOGRAPHS

A complete line for widespread industrial and laboratory applications, from light-weight units with 2″ tubes to laboratory instruments with 9″ tube and high sensitivity amplifiers substantially flat from 30 to 10 million cycles.

TYPE 315-A ELECTRONIC SWITCH

Automatically switches electronically between two signals, to give a portion of one trace alternating rapidly with a portion of the other—two visually continuous curves easily compared for wave-form, shape, phase, etc.

ULTRA-SENSITIVE D.C. METER

Measures minute galvanic currents (to .02 microamperes) encountered in secondary emission phenomena, electrolysis and hydrolysis, etc. Extremely stable. Feedback circuit makes overload burnouts virtually impossible.

INDUSTRIAL PRESSURE-MEASURING EQUIPMENT

Type 307-A Pressure-Conversion Unit . . . Type 319-A Pre-Amplifier . . . No. 9786 Synchronizer . . . No. 9765 Vibration Pick-Up Unit. For gasoline and diesel engineering test purposes.

RADIO BROADCAST MEASURING EQUIPMENT

312-A Noise Meter . . . 318-A Direction Finder . . . Direct-Reading Field Intensity Meters, Beat Frequency Audio Oscillators . . . Distortion Meters . . . Frequency Monitors . . . Power Supply Units for all vacuum-tube operated devices.

Write for Complete Data and Literature

RCA Measuring Equipment

RCA Manufacturing Co., Inc., Camden, N. J.

A Service of the Radio Corporation of America

INDEX Section

ABRASION MACHINES (See Testers, Abrasion)

ABSOLUTE PRESSURE INDICATORS (See Gages, Absolute Pressure)

ABSORPTIOMETERS
Brabender Corp.

ACCELEROMETERS
Alpha Instrument Co.
American Askania Corp.
Brush Development Co.
Cambridge Inst. Co.
Commercial Eng. Labs.
Cramer & Co., Inc.
General Elec. Co.
Hathaway Inst. Co.
Kollsman Inst. Co.
Pioneer Inst. Co.
Ruska & Co.
Thwing-Albert Inst. Co.

ACIDIMETERS
Eimer & Amend
Hellige, Inc.
Henszey Co.
Rieker Inst. Co.
Rubicon Co.
Ruehfel Co.
Tagliabue Mfg Co.
Thwing-Albert Inst. Co.
Uehling Instrument Co.

ACOUSTIMETERS (See Sound Level Meters)

AEROGRAPHS
Fuess, Inc.

AEROMETERS
Friez & Sons

AIR ANALYSIS APPARATUS (See Gas Analyzers, Air)

AIRCRAFT NAVIGATIONAL INSTRUMENTS
American Askania Corp.
Bausch & Lomb Opt.
Consol.-Ashcroft-Hancock
Fuess, Inc.
General Elec. Co.
Gurley, W. & L. E.
Hathaway Inst. Co.
Hickok Elec. Inst. Co.
Jaeger Watch Co.
Kollsman Inst. Co.
Machlett & Son
Moisture Register Co.
Pioneer Instrument Co.
Rieker Inst. Co.
Sperry Gyroscope Co.
RCA Manufacturing Co
Schwien Engg. Co.
Simmonds Accessories
United Cinephone Corp
Weston Elec. Inst. Corp.
Carl Zeiss, Inc.

AIRCRAFT POWER PLANT INSTRUMENTS
Beck Bros.
Bowser & Co.
Cambridge Inst. Co.
De Jur-Amsco Corp.
General Elec. Co.
Hays Corp.
Jaeger Watch Co.
Kenyon Instrument Co.
Kollsman Inst. Co.
Moisture Register Co.
Pioneer Instrument Co.
Rieker Inst. Co.
Thwing-Albert Inst. Co.
U. S. Gauge Co.
Weston Elec. Inst Corp.
Lewis Engg. Co.
Roller-Smith Co.
Westinghouse Elec. & Mfg.

AIR DISTANCE, Indicators & Recorders
Jaeger Watch Co.

AIR FLOW METERS (See Flowmeters, Air)

AIR METERS (See Gas Meters, Positive)

AIRSPEED INDICATORS (See also Aircraft)
American Askania Corp.
Fuess, Inc.
Illinois Testing Labs.
Jaeger Watch Co.
Kollsman Inst. Co.
Pioneer Instrument Co.
Schwien Engg. Co.
U. S. Gauge Co.
Zernickow Co.

AIRSPEED INDICATOR TESTERS
Amthor Test. Inst. Co.
Jaeger Watch Co.
Pioneer Instrument Co.

ALARMS, Carbon Bisulphide
Bushnell & Nevins

ALARMS, Carbon Monoxide, Combustible Gas, etc.
Mine Safety Appliances

ALARMS, High, low water (See Alarms, Liquid Level)

ALARMS, Hydrogen Sulphide
Bushnell & Nevins
Johnson-Williams, Ltd.

ALARMS, Inflammable Gas
Bristol Co.
Davis Emergency Equip.
Engineering Labs., Inc.
Johnson-Williams, Ltd.
Leeds & Northrup Co.
Mine Safety Appliances
Viking Instruments, Inc.
Wheelco Instruments Co.

ALARMS, Liquid Level
Autocall Co.
Automatic Control Co.
Bailey Meter Co.
Bin-Dicator Co.
Boston Auto Gage Co.
Brown Inst. Co.
Cutler-Hammer, Inc.
Inferno Co.
Lumenite Electric Co.
Mason-Neilan Regulator
McAlear Mfg. Co.
McDonnell & Miller
Mercoid Corp.
Minneapolis-Honeywell
Morey & Jones, Ltd.
Reliance Gauge Column
Republic Flow Meters Co.
Tagliabue Mfg. Co.
Taylor Instrument Cos.
United Cinephone Corp.
Wheelco Instruments Co.
Wright-Austin Co.
Yarnall-Warning Co.

ALARMS, SMOKE (See Smoke Density Indicators)

ALIDADES (See Surveying Instruments)

ALKALIMETERS
Ace Glass Inc.
Central Scientific Co.
Eimer & Amend
Fisher Scientific Co.
General Elec. Co.
Hellige, Inc.
Kimble Glass Co.
Rubicon Co.
Ruehfel Co.
Specialty Glass Co.
Tagliabue Mfg. Co.

ALTIMETERS (See Barometers, Altitude)

ALTIMETER TESTERS
Amthor Test. Inst. Co.
Fuess, Inc.
Kenyon Instrument Co.
Pioneer Instrument Co.

ALTITUDE BAROMETERS (See Barometers, Altitude)

AMMETERS, Contact-making
Esterline-Angus Co.
General Electric Co.
Hickok Electrical Inst.
Reliance Instrument Co.
Roller-Smith Co.
Weston Electrical Inst.

AMMETERS, Indicating
Burton-Rogers Co.
Cambridge Inst. Co.
Columbia Elec. Mfg.
De Jur-Amsco Corp.
Engelhard, Chas.
Ferranti Electric, Inc.
General Elec. Co.
Hickok Elec. Inst. Co.
King-Seeley Corp.
Lundquist Tool & Mfg.
Niagara Electrical Inst.
Norton Electrical Inst.
Precision Apparatus Corp.
Radio City Products Co.
Rawson Elec. Inst. Co.
Reliance Instrument Co.
Rochester Mfg. Co.
Roller-Smith Co.
Sensitive Research Inst.
Simpson Electric Co.
Therm-Electric Meters
Triplett Electrical Inst.
Welch Mfg. Co.
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.
Wheelco Inst. Co.
Winslow Co.

AMMETERS, Microammeters
Burton-Rogers Co.
Cambridge Inst. Co.
Clough-Brengle Co.
De Jur-Amsco Corp.
Engelhard, Chas.
General Elec. Co.
Hickok Elec. Inst. Co.
Pfaltz & Bauer, Inc.
Radio City Products Co.
RCA Manufacturing Co.
Rawson Elec. Inst. Co.
Roller-Smith Co.
Sensitive Research Inst.
Simpson Elec. Co.
Supreme Instruments
(Cont'd)

AMMETERS, Microammeters (continued)
Tagliabue Mfg. Co.
Triplett Electrical Inst.
Triumph Mfg. Co.
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.
Wheelco Inst. Co.
Winslow Co.

AMMETERS, Milliammeters
Bristol Co.
Burton-Rogers Co.
Cambridge Inst. Co.
Clough-Brengle Co.
De Jur-Amsco Corp.
Engelhard, Chas.
Esterline-Angus Co.
General Elec. Co.
Hickok Elec. Inst. Co.
Lundquist Tool & Mfg.
Norton Electrical Inst.
Precision Apparatus Corp.
Radio City Products Co.
Rawson Elec. Inst. Co.
RCA Manufacturing Co.
Roller-Smith Co.
Sensitive Research Inst.
Simpson Elec. Co.
Supreme Inst. Corp.
Tagliabue Mfg. Co.
Triplett Electrical Inst.
Welch Mfg. Co.
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.
Wheelco Inst. Co.
Winslow Co.

AMMETERS, Recording
Autocall Co.
Bristol Co.
Cambridge Inst. Co.
Engelhard, Chas.
Esterline-Angus Co.
General Elec. Co.
Leeds & Northrup Co.
Roller-Smith Co.
Tagliabue Mfg. Co.
Westinghouse Elec. & Mfg.

AMMETERS, Split Core
Columbia Elec. Mfg.
General Elec. Co.
HD Elec. Co.
Norton Electrical Inst.
Roller-Smith Co.
Rubicon Co.
Western Electro-Mech.
Weston Elec. Inst. Corp.

AMMETERS, Surge-Crest
General Elec. Co.
Roller-Smith Co.

AMMETERS, Thermionic
Victor J. Andrew
General Radio Co.

AMMETERS, Thermo
American Elec. Sales Co.
Cambridge Inst. Co.
General Elec. Co.
Hickok Elec. Inst. Co.
Rawson Elec. Inst. Co.
Roller-Smith Co.
Sensitive Research Inst.
Therm-Electric Meters
Triplett Electrical Inst.
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.

AMMETERS, Zero-Resistance
Hickok Elec. Inst. Co.
Sensitive Research Inst.

AMMONIA ANALYZERS (See Gas Analyzers, Ammonia)

AMMONIA CONTROL EQUIPMENT
Arca Regulators, Inc.
Bailey Meter Co.
Cash Co.
Everson Mfg. Co.
Fischer & Porter
Frick Co.
Hoke, Inc.
Marsh Corp., Jas. P.
McAlear Mfg. Co.
Mercoid Corp.
Philadelphia Thermo. Co.
Refrigerating Spec. Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Wallace & Tiernan Prods.

AMPEREHOUR METERS
Economy Electric Devices
Landis & Gyr, Inc.
Sangamo Electric Co.
Westinghouse Elec. & Mfg.

AMPLIFIERS, A-c.
Electronic Design Corp.
Electronic Lab.
General Radio Co.
Heiland Research Corp.
Jones-Orme Co.
Luxtrol Co., Inc.
McFarlin Co.
Raytheon Mfg. Co.
RCA Manufacturing Co.
Thordarson Elec. Co.
Triumph Mfg. Co.
United Cinephone Corp.
United Transformer

AMPLIFIERS, Audio Frequency (See Audio-Frequency Equipment)

AMMETERS
—and instruments for all electrical measurement needs

All the types, sizes, ranges and operating specifications for laboratory, switchboard and maintenance requirements . . . including the AC Clamp-Ammeter which permits quick current measurements without disturbing circuits under test. Bulletins available. Weston Electrical Instrument Corporation, 591 Frelinghuysen Avenue, Newark, New Jersey.

WESTON *Instruments*

HIGHEST HICKOK **ACCURACY**

Hickok Astatic portable instruments suitable for laboratory use have an accuracy of .2 of 1% and are not influenced by external magnetic fields. Suitable for use on alternating or direct current. The Hickok complete line of portables includes two different case styles, and ammeters, voltmeters, milliammeters, wattmeters, microammeters and millivoltmeters in all ranges. Special portable instruments built for special needs.

Complete catalog on request

HICKOK
ELECTRICAL INSTRUMENT COMPANY
10514 DUPONT AVE., CLEVELAND, OHIO

KOLLSMAN
PRECISION AIRCRAFT INSTRUMENTS

ACCELEROMETERS
AIR SPEED INDICATORS
ALTIMETERS
CLIMB INDICATORS
COMPASSES
DIRECTION INDICATORS
ELECTRIC TACHOMETERS
FUEL QUANTITY GAGES
FUEL PRESSURE GAGES
ICE WARNING INDICATORS
MANIFOLD PRESSURE GAGES
OIL PRESSURE GAGES
PITOT-STATIC TUBES
PRESSURE WARNING UNITS
SENSITIVE ALTIMETERS
STATION BAROMETERS
SUCTION GAGES
TACHOMETERS
TELEGON REMOTE INDICATORS
THERMOMETERS
VERTICAL SPEED INDICATORS

KOLLSMAN INSTRUMENT DIVISION
OF SQUARE D COMPANY
80-08 FORTY-FIFTH AVENUE, ELMHURST, N. Y.

For addresses, see pages 66-76

AMPLIFIERS, Commercial Frequency
Electronic Design Corp.
General Radio Co.
Jones-Orme Co.
Luxtrol Co., Inc.
McFarlin Co.
Raytheon Mfg. Co.
Televiso Co.
United Cinephone Corp.
United Transformer Corp.

AMPLIFIERS, D-c.
Electro-Medical Lab.
Electronic Design Corp.
Electronic Lab.
General Elec. Co.
General Radio Co.
Jones-Orme Co.
Luxtrol Co., Inc.
McFarlin Co.
Raytheon Mfg. Co.

AMPLIFIERS, Radio Frequency
Andrew, Victor J.
Ferris Inst. Corp.
Geophysical Inst. Co.
Jones-Orme Co.
McFarlin Co.
Measurements Corp.
Raytheon Mfg. Co.
RCA Manufacturing Co.
Remler Co., Ltd.
Triumph Mfg. Co.

ANALYZERS, Chemical Composition, Recording & Controlling
Applied Research Labs.
Cambridge Instrument
Coleman Electric Co.
Dietert Co., Harry W.
Fisher Scientific Co.
Friez & Sons
Industrial Instruments
Leeds & Northrup Co.
Machlett & Son, E.
Mine Safety Appliances
National Technical Labs.
Rubicon Co.
Sargent & Co., E. H.
Scientific Glass App.
Tagliabue Mfg. Co., C. J.
United Cinephone Corp.

ANALYZERS, Gas Composition, Recording & Indicating
(See Gas Analyzers)

ANALYZERS, Ignition System
Hickok Electrical Inst.
Hy Ef Electrical Products
Lantz-Phelps Corp.
Nichoff & Co., C. E.

ANALYZERS, Industrial Power
Elec. Facilities, Inc.
Weston Elec. Inst. Corp.

ANALYZERS, Radio Set
Aerovox Corp.
Burton Rogers Co.
Clough-Brengle Co.
Electronic Design Corp.
Hickok Elec. Inst. Co.
Jackson Electrical Inst.
Precision Apparatus Corp.
Radio City Products Co.
Raytheon Mfg. Co.
RCA Manufacturing Co.
Simpson Elec. Co.
Supreme Instruments
Triplett Elec. Inst. Co.
Triumph Mfg. Co.
United Cinephone Corp.
Webber Co., Earl
Weston Elec. Inst. Corp.

ANALYZERS, Sound
Amperite Corp.
Clough-Brengle Co.
Electrical Research Prod.
Electronic Design Corp.
Gaertner Scientific Corp.
General Elec. Co.
General Radio Co.
Hickok Elec. Inst. Co.
Jones-Orme Co.
Televiso Co.
United Cinephone Corp.
Westinghouse Elec. & Mfg.

ANEMOMETERS, Hot-wire
Friez & Sons

ANEMOMETERS, Mechanical.
American Inst. Co.
Dietzgen Co.
Friez & Sons
Fuess, Inc.
Geophysical Inst. Co.
G. M. Mfg. Co.
Green, Henry J.
Kenyon Instrument Co.
Keuffel & Esser Co.
Mine Safety App. Co.
Mico Instrument Co.
Rieker Inst. Co.
Spence Engineering Co.
Taylor Inst Cos.
White Co., Inc.
Willson Products, Inc.

ANGULAR MOMENTUM DEMONSTRATOR
Eastern Science Co.
Mico Instrument Co.

APPARATUS, Laboratory
Aloe Co., A. S.
American Elec. Sales Co.
American Indicator Paper
American Inst. Co.
American Meter Co.
Atlas Electric Devices
Baird Associates
Bausch & Lomb Opt.
Becker, Joseph
Berge, J. & H.
Best Scientific Glass
Biological Supply Co.
Boekel & Co.
Boonton Radio Corp.
Brabender Corp.
Braun Corp.
Braun-Knecht-Heimann
Buehler, Adolph I.
Buffalo Apparatus Corp.
Burrell Tech. Supply Co.
Calkins Co.
Callahan & Co.
Calta Glass Works
Cambosco Scientific Co.
Cargille, R. P.
Central Scientific Co.
Chemical Rubber Co.
Chicago Apparatus Co.
Chicago Surgical
Cincinnati Scientific Co.
Claffin Co.
Clay-Adams Co.
Clough-Brengle Co.
Conant, George H.
Curtin & Co.
Daigger & Co.
Daven Company
Demuth Glass Works
Denver Fire Clay Co.
Doerr Glass Co.
Eastern Scientific Co.
Eberbach & Sons
Eimer & Amend
Elec. Facilities Inc.
Electro-Medical Lab.
Empire Lab. Supply
(Cont'd)

APPARATUS, Laboratory (Cont'd)
Ervin Co.
Fassett Co., Inc.
Federal Pneumatic Sys.
Ferner Co.
Ferris Inst. Corp.
Fish-Schurman Co.
Fisher Scientific Co.
Fredericks, George E.
Freed, J. Melvin
Frober-Faybor Co.
Gaertner Scientific Corp.
General Biological Supply
General Radio Co.
Gerrish-Padgett Corp.
Gilmore Drug Co.
G-M Labs.
Goetze Niemer Co.
Gotham Scientific Co.
Greene Bros., Inc.
Greiner, Inc., Emil
Griner Co., A. J.
Hausser & Son
Heil Chemical & Mfg.
Hoke, Inc.
Howe & French Inc
Humboldt Mfg. Co.
Industrial-Scientific Sup.
International Bus. Mach.
Kansas City Lab. Supply
Kauffman-Lattimer Co.
Koch & Co.
Laboratory Const. Co.
Laboratory Materials Co.
Laboratory Specialties
LaPine & Co.
Levitt Ferguson Co.
Macalaster Bicknell Co.
Machlett & Son
Mahady Co.
Maris Co., John M.
McKesson-Doster-Northington
Meyer, Max
Microchemical Service
Mine & Smelter Sup. Co.
Nashville Surgical Supply
National Scientific Corp.
N. J. Laboratory Supply
N. Y. Laboratory Supply
New York Scien. Supply
Pacific Biological Labs.
Palo-Myers, Inc.
Parr Instrument Co.
Phipps & Bird, Inc.
Precision Scientific Co.
Rascher & Betzold
RCA Manufacturing Co.
Refinery Supply Co.
Rieker Inst. Co.
Robertson & Co.
Rochester Lab. Supply
Roemer Drug Co.
Ruehfel Co., George
Rupp & Bowman Co.
Sargent & Co.
Schaar & Company
Schettle's Frog Farm
Scientific Glass App.
Scientific Inst. Co.
Scientific Supplies Co.
Sodemann Heat & Power
Sound Apparatus Co.
Spencer Lens Co.
Standard Glass App.
Standard Scien. Supply
Steele, Erick F.
Stoelting Co., C. H.
Tagliabue Mfg. Co.
Teschner-Quinn Corp.
Thomas Co., Arthur H.
University Apparatus Co.
(Cont'd)

APPARATUS, Laboratory (Cont'd)
Victor Equipment Co.
Walker & Co., Geo. T.
Ward's Natural Science
Welch Mfg. Co.
Western Machinery Co.
Western Scientific Co.
Wheaton Co., T. C.
Wilkens-Anderson Co.
Will Corporation
Williams Apparatus Co.
Williams, Brown & Earle
Woods "Lab. Apparatus"
Yonkers Lab. Supply Co.

APPARATUS, Laboratory, Fused Quartz
Thermal Syndicate Ltd.

APPARATUS, Laboratory, Glass
Ace Glass Inc.
American Inst. Co.
Boekel & Co.
Central Scientific Co.
Chicago Apparatus Co.
Clay-Adams Co.
Corning Glass Works
Eimer & Amend
Fischer & Porter
Fish-Schurman Co.
Fisher Scientific Co.
General Biological
Griebel Instrument Co.
Kimble Glass Co.
Macalaster Bicknell Co.
Machlett & Son
Microchemical Service
Pfaltz & Bauer, Inc.
Philadelphia Therm. Co.
(Cont'd)

APPARATUS, Laboratory, Glass (Cont'd)
Rascher & Betzold
Refinery Supply
Rieker Inst. Co.
Ruth Glass Division
Sargent & Co.
Scientific Glass App.
Scientific Inst. Co.
Specialty Glass Co.
Tagliabue Mfg. Co.
Thomas Co., Arthur H.
Welch Mfg. Co.
Wilkens-Anderson Co.

AREA METERS (See Flow Meters, Area)

ARTIFICIAL HORIZON (See also Aircraft)
Eastern Science Co.

ARTILLERY (See Ordnance)

ASPHALT PENETRATION NEEDLES (See Needles, Asphalt Penetration)

ASPHALT TESTING APPARATUS (See Testers, Asphalt)

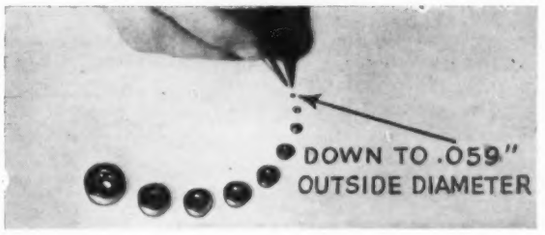
ASTRONOMICAL INSTRUMENTS
American Askania Corp.
Am. Telescope Labs.
Clark & Sons
Eastern Science Co.
Fecker, J. W.
Gaertner Scientific Corp.
Kern Co.
Lenox Inst. Co.
Mico Instrument Co.
(Cont'd)

ASTRONOMICAL INSTRUMENTS (Cont'd)
Perkin-Elmer Corp.
Pioneer Instrument Co.
Taylor Inst. Cos.
Tinsley Labs.
Carl Zeiss, Inc.
Warren-Knight Co.

ATTENUATORS
Clarostat Mfg. Co.
Daven Co.
General Radio Co.
Hickok Electrical Inst.
International Resistance
Measurements Corp.
Ohmite Mfg. Co.
Remler Co.
Rowe Radio Research Lab.
Shallcross Mfg. Co.

AUDIO-FREQUENCY EQUIPMENT
Ballantine Labs.
Boonton Radio Corp.
Clough-Brengle Co.
Electro-Medical Lab.
Electronic Design Corp.
General Radio Co.
Geophysical Inst. Co.
Hickok Elec. Inst. Co.
Jones-Orme Co.
Lipman Engg. Co.
Luxtrol Co., Inc.
McFarlin Co.
Raytheon Mfg. Co.
RCA Manufacturing Co.
Remler Co., Ltd.
Televiso Co.
Thordarson Elec. Co.
Triumph Mfg. Co.
(Cont'd on next page)

R. M. B. Miniature Ball Bearings



These unique small bearings are ideal for all kinds of instruments, precision tools, motors, indicators, oscillators, timing and weighing devices, and any number of other mechanisms having small moving parts.

Write for bulletin C 3 containing complete information on dimensions, load capacities, fittings, tolerances, and other interesting details.

LANDIS & GYR, INC.
104 Fifth Avenue, New York

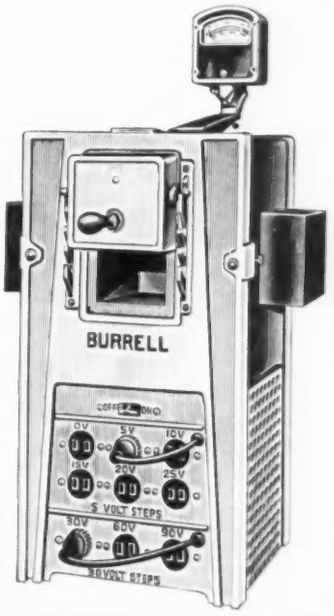
for testing up to 2500°F.

Ask for new Burrell Bulletins describing both Box and Tube Types of Laboratory H. T. Furnaces

• Big Chamber
4" w.—7" d.—3½" h.

Some Suggested Uses

Technical Research
Heat Treating
Cement Sintering
Glaze Testing
Ceramic Firing
Alumina Ignitions
Chemical Fusions
Insulation Proving
Tool Hardening
College Work



BURRELL
TECHNICAL SUPPLY COMPANY
1936-42 Fifth Avenue Pittsburgh, Pa.

For addresses, see pages 66-76

BALANCES *and* WEIGHTS *of Precision*

Analytical	Grain
Assay	Laboratory
Air Dash Pot	Magnetically Damped
Bullion	Metabolism
"Chainomatic"	Micro
Dairy	Projection
Diamond	Specific Gravity
Drug	Surface Tension
Gold	Textile, etc.

BECKER CHRISTIAN

TORSION BALANCE CO.

Sales Offices:

92 Reade Street, New York City
228 North La Salle Street, Chicago
1400 Sixteenth Street, San Francisco
Factory: 147-153 Eighth St., Jersey City, N. J.

AUDIO-FREQUENCY EQUIPMENT (Cont'd)
United Cinephone Corp.
United Transformer Corp.
Victor Equipment Co.
United Sound Eng. Co.
United Transformer Corp.
Westinghouse Elec. & Mfg.

AUDIO-FREQUENCY OSCILLATORS (See Oscillators, Audio - Frequency)

AUTO-COLLIMATORS
American Inst. Co.
Clark & Sons
Fecker, J. W.
Kollmorgen Optical Co.

AUTOMATIC (See Controllers or Regulators)

AUTOMOTIVE SERVICE INSTRUMENTS
Bacharach Indus. Inst.
Bear Mfg. Co.
Burton-Rogers Co.
Cambridge Inst. Co.
Clough-Brengle Co.
Engelhard, Chas.
Hays Corp.
Hickok Elec. Inst. Co.
Hy-Ef Electrical Prods.
Instrument Specialties Co.
Niehoff & Co.
Potter Co.
Rieker Inst. Co.
Ruth Glass Division
Weston Elec. Inst. Corp.

AZIMUTH INSTRUMENTS
Bliss & Co.
Eastern Science Co.
Fecker, J. W.
Gaertner Scientific Corp.
Kern Co.
Keuffel & Esser Co.
Kollmorgen Optical Co.
Negus, T. S. & J. D.
Pioneer Instrument Co.
Warren-Knight Co.

BALANCES (See also object of measurement and control)

BALANCES, Analytical
Ainsworth & Sons
Akatos, Inc.
Becker Inc., Christian
Central Scientific Co.
Chicago Apparatus Co.
Exact Weight Scale Co.
Fisher Scientific Co.
Heusser Instrument
Keller Mfg. Co.
Microchemical Service
Pfaltz & Bauer, Inc.
Seederer-Kohlbusch, Inc.
Suter, Alfred
(Cont'd)

BALANCES, Analytical (Continued)
Thomas Co., Arthur H.
Torsion Balance Co.
Troemner, Henry
Voland & Sons, Inc.

BALANCES, Assay
Ainsworth & Sons
Becker Inc., Christian
Central Scientific Co.
Chicago Apparatus Co.
Exact Weight Scale
Heusser Instrument
Keller Mfg. Co.
Roller-Smith Co.
Seederer-Kohlbusch, Inc.
Torsion Balance Co.
Troemner, Henry
Voland & Sons, Inc.

BALANCES, Automatic Recording
Roller-Smith Co.

BALANCES, Bullion
Becker Inc., Christian
Exact Weight Scale
Seederer-Kohlbusch, Inc.
Torsion Balance Co.
Troemner, Henry
Voland & Sons, Inc.

BALANCES, Gas Density
Central Scientific Co.
Refinery Supply Co.

BALANCES, Hydrostatic
Central Scientific Co.
Chicago Apparatus Co.
Seederer-Kohlbusch, Inc.

BALANCES, Jewelers
Becker Inc., Christian
Seederer-Kohlbusch, Inc.
Torsion Balance Co.
Troemner, Henry
Voland & Sons, Inc.

BALANCES, Joly's
Central Scientific Co.
Welch Mfg. Co.

BALANCES, Magnetic
Becker Inc., Christian
Seederer-Kohlbusch, Inc.
Torsion Balance Co.

BALANCES, Magnetic (Geophysical)
American Askania Corp.
Geophysical Inst. Co.

BALANCES, Micro
Ainsworth & Sons
Akatos, Inc.
Becker Inc., Christian
Central Scientific Co.
Heusser Instrument
Microchemical Service
Pfaltz & Bauer, Inc.
Thomas Co., Arthur H.
Torsion Balance Co.
Voland & Sons, Inc.

BALANCES, Precision, for Weights & Measures
Ainsworth & Sons
Akatos, Inc.
Becker Inc., Christian
Central Scientific Co.
Exact Weight Scale Co.
Heusser Instrument
W. & L. E. Gurley
Howe Scale Co.
Jacobs Bros. Co.
Newark Scale Works
Pfaltz & Bauer, Inc.
Roller-Smith Co.
Seederer-Kohlbusch, Inc.
Torsion Balance Co.
Troemner, Henry
Voland & Sons, Inc.
Welch Mfg. Co.

BALANCES, Pulp
Ainsworth & Sons
Becker Inc., Christian
Central Scientific Co.
Exact Weight Scale
Heusser Instrument
Jacobs Bros. Co.
Seederer-Kohlbusch, Inc.
Torsion Balance Co.
Troemner, Henry
Voland & Sons, Inc.
Williams Apparatus Co.

BALANCES, Specific Gravity
Baird Associates
Becker Inc., Christian
Bllackley, G. S.
Scientific Co.
Chicago Apparatus Co.
Exact Weight Scale Co.
Heusser Instrument
Humboldt Mfg. Co.
Newark Scale Works
Pfaltz & Bauer, Inc.
Ruehfel Co.
Seederer-Kohlbusch, Inc.
Torsion Balance Co.
Troemner, Henry

BALANCES, Surface Tension
Becker Inc., Christian
Central Scientific Co.
Roller-Smith Co.
Seederer-Kohlbusch, Inc.
Torsion Balance Co.

BALANCES, Torsion (Geophysical)
American Askania Corp.

BALANCES, Triple Beam
Ainsworth & Sons, Inc.
Dietert Co., Harry W.
Exact Weight Scale Co.
Fisher Scientific Co.
Seederer-Kohlbusch, Inc.
Troemner, Henry
Welch Scientific Co.

BALANCES, Volumetric Flask
Becker Inc., Christian
Seederer-Kohlbusch, Inc.
Torsion Balance Co.

BALANCES, Westphal
Becker Inc., Christian
Central Scientific Co.
Chicago Apparatus Co.
Eimer & Amend
Pfaltz & Bauer, Inc.
Newark Scale Works
Seederer-Kohlbusch, Inc.
Torsion Balance Co.
Troemner, Henry

BALANCING MACHINES, Dynamic
Ajax Engg. Co.
Bear Mfg. Co.
Electrocon Corp.
Ferner Co.
General Elec. Co.
Gisholt Machine Co.
Globe Tool & Engg.
Olsen Testing Machine
Suter, Alfred

BALANCING MACHINES, Static
Ajax Engg. Co.
Anderson Bros. Mfg. Co.
Bear Mfg. Co.
Commerce Pattern Fdy.
Ferner Co.
Gisholt Machine Co.
Globe Tool & Engg.
Ideal Commutator Dresser
Olsen Testing Machine
Suter, Alfred
Taylor Mfg. Corp.
Toledo Scale Co.

BALLISTIC INSTRUMENTS, Crime Detection (See Microscopes, Ballistic Comparison)

BALLISTIC INSTRUMENTS, Electrical
Cambridge Inst. Co.
General Elec. Co.
Leeds & Northrup Co.
Precision Ther. & Inst.
Rawson Electrical Inst.
Rubicon Co.
Sensitive Research Inst.

BALLISTIC INSTRUMENTS, Ordnance
Bausch & Lomb Opt.
Cambridge Inst. Co.
Precision Ther. & Inst.

BARKOMETERS
Central Scientific Co.
Eimer & Amend
Fleischhauer & Son
G. M. Mfg. Co., Inc.
(Cont'd)

ANNOUNCING FOR 1941

the creation of a new unit

GREINER OPTICAL INDUSTRIES

A Division of GLASS INDUSTRIES COMPANIES, a complete manufacturing unit for producing optical parts, a variety of lenses and prisms, and eventually, complete optical equipment.

Our progress will be slow but definite, in order that we can benefit the Industries we are serving.

GLASS ENGRAVING COMPANY

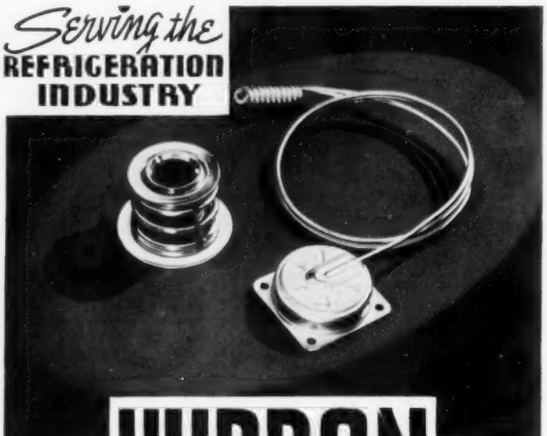
A division of GLASS INDUSTRIES COMPANIES will continue to serve the Laboratory and Instrument Industries as it has done in the past years.

LEOPOLD E. GREINER

will continue his Practical Consultant Service on matters pertaining to Engraving and Etching of "PYREX" resistance glass, flint glass and other glass now in use in the Industries.

GLASS ENGRAVING PRODUCTION
GLASS ENGRAVING COMPANY, 3604 Park Ave., N.Y.C.

Serving the REFRIGERATION INDUSTRY



HYDRON

METALLIC BELLOWS
produced
hydraulically
BY
CLIFFORD MANUFACTURING CO.
564 E. FIRST STREET, BOSTON
BOSTON CHICAGO DETROIT LOS ANGELES
PRODUCERS OF BELLOWS EXCLUSIVELY
SERVING AUTOMATIC CONTROL MANUFACTURERS

COMPLETE ENGINEERING SERVICE

For addresses, see pages 66-76

Bridges . . . WHEATSTONE · KELVIN · SCHERING · HOOPES FOR RESEARCH AND TESTING

For d-c or a-c resistance measurements, or for a-c measurements of inductance, capacitance and phase angle, we are prepared to furnish precision instruments of proved accuracy and reliability.

Because we carry in stock a large number of parts and assemblies, we are often able to supply special instruments to meet unusual problems—in many cases at a cost not greatly in excess of that for our regularly listed apparatus.

LEEDS & NORTHRUP CO.
4984 STENTON AVENUE, PHILADELPHIA

MEASURING INSTRUMENTS · TELEMETERS · AUTOMATIC CONTROLS · HEAT-TREATING FURNACES

BARKOMETERS (Continued)
Griebel Instrument Co.
H-B Inst. Co., Inc.
Moeller Instrument Co.
Precision Therm. & Inst.
Ruehfel Co.
Schultheis Corp.
Tagliabue Mfg. Co.
Taylor Inst. Cos.

BAROGRAPHS (See Barometers, Recording)

BAROMETERS, Altitude
American Askania Corp.
Am. Paulin System
Friez & Sons
Fuess, Inc.
Green, Henry J.
Kenyon Instrument Co.
Keuffel & Esser Co.
Kollsman Inst. Co.
Mine Safety App. Co.
Pioneer Inst. Co.
Taylor Inst. Cos.
Warren-Knight

BAROMETERS, Aneroid
Am. Paulin System
Central Scientific Co.
Fee & Stemwedel
Friez & Sons
Fuess, Inc.
Kenyon Instrument Co.
Keuffel & Esser Co.
Kollsman Inst. Co.
Pioneer Instrument Co.
Scientific Inst. Co.
Taylor Inst. Cos.
Testrite Instrument Co.
Warren-Knight Co.

BAROMETERS, Mercurial
Alpha Instrument Co.
Central Scientific Co.
Chicago Apparatus Co.
Consol. Ashcroft-Hancock
Defender Automatic Reg.
Eimer & Amend
Fisher Scientific Co.
Friez & Sons
Fuess, Inc.
Green, Henry J.
Kessler Co.
Moeller Instrument Co.
Pioneer Instrument Co.
Precision Thermometer & Inst.
Sargent & Co.
Scientific Inst. Co.
Specialty Glass Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Uehling Instrument Co.
Welch Mfg. Co.

BAROMETERS, Recording
American Askania Corp.
Am. Paulin System
Bristol Co
Brown Inst. Co.
Foxboro Co.
Friez & Sons
Fuess, Inc.
Green, Henry J.
Kenyon Instrument Co.
Keuffel & Esser Co.
Taylor Inst. Cos.
Uehling Instrument Co.

BAROMETRIC PRESSURE INDICATORS
Am. Paulin System
Bristol Co.
Brown Inst. Co.
Consol. Ashcroft-Hancock
Fee & Stemwedel
Foxboro Co.
Friez & Sons
Fuess, Inc.
Kenyon Instrument Co.
Keuffel & Esser Co.
Kollsman Inst. Co.
Pioneer Instrument Co.
Precision Therm. & Inst.
Tagliabue Mfg. Co.
Taylor Inst Cos.
Uehling Instrument Co.
Warren-Knight Co.

BAROMETRIC PRESSURE RECORDERS (See Barometers, Recording)

BATTERIES, Dry
Burgess Battery Co.

BATTERY CHARGERS
Automatic Electric Co.
Cutler-Hammer, Inc.
Electrical Facilities, Inc.
Ferranti Electric, Inc.
General Electric Co.
Hy Ef Electrical Products
Ward Leonard Electric Co.

BATTERY ELIMINATORS
Automatic Electric Co.
Electro Products Labs.
Standard Electric Time Co.

BATTERY TESTERS (See Testers, Battery)

BEAM COMPASSES (See Drawing Instruments)

BEARING CIRCLES
Alpha Instrument Co.
Kollmorgen Optical Co.

BEARING TESTERS (See Testers, Bearing)

BEATING TESTERS (See Testers, Beating)

BELLOWS, METALLIC
Clifford Mfg. Co.
Fulton Sylphon Co.

BENCHES, Optical
American Askania Corp.
Baird Associates
Bausch & Lomb
Bryden Co.
Cambridge Inst. Co.
Central Scientific Co.
Chicago Apparatus Co.
Frober-Faybor Co.
Fuess, Inc.
Gaertner Scientific Corp.
Geophysical Inst. Co.
E. Leitz, Inc.
Mico Instrument Co.
Carl Zeiss, Inc.

BEVEL PROTRACTORS (See Drawing Instruments)

BINNACLES (See Nautical Instruments)

BINOCULARS
Alpha Instrument Co.
Am. Telescope Labs.

BINOCULARS (Continued)
Bausch & Lomb Optical
Clark & Sons
Kern Co.
Leitz, Inc.
Testrite Instrument Co.
Warren-Knight Co.
Wollensak Optical Co.
Zeiss, Inc., Carl

BINOCULARS, Polarizing, Variable Density, etc.
Amer. Telescope Labs.
Polarizing Inst. Co.

BIOLOGICAL SPECIMENS
Central Scientific Co.
Chicago Apparatus Co.
General Biological Sup.

BLAST METER (See Flow Meters, Blast)

BOILER METERS
American Meter Co.
Bailey Meter Co.
Brown Inst. Co.
Ess Inst. Co.
Foxboro Co.
Hays Corp.
Henszey Co.
Republic Flow Meters
Tagliabue Mfg. Co.

BOLOMETERS
Cambridge Inst. Co.
Hoffman Co., S. O.

BOMBS, High pressure for testing bottom hole samples, Oil & Gas
Ruska & Co., Inc.

BOMBS, Hydrogenation
Parr Instrument Co.

BOMBS, Lean Oil
Daniel Orifice Fitting Co.

BOMBS, Micro Combustion
Parr Instrument Co.

BOMBS, Oxygen
Parr Instrument Co.

BOMBS, Reid Vapor Pressure
American Inst. Co.
Central Scientific Co.
Daniel Orifice Fitting
Precision Scientific Co.
Refinery Supply Co.
Tagliabue Mfg. Co.

BOMBS, Sodium Peroxide
Parr Instrument Co.

BOMBS, Specific Gravity
Central Scientific Co.
Daniel Orifice Fitting
Refinery Supply Co.

BOMBS, Sulphur
Central Scientific Co.
Parr Instrument Co.

BOMBS, Temperature
Martin Decker Corp.

BOTTLES, Cubic Foot
American Meter Co.
Central Scientific Co.
Fish-Schurman Co.
Lambert Meter Co., Inc.
Precision Scientific Co.

BOTTLES, Specific Gravity
Ace Glass Inc.
American Meter Co.
Central Scientific Co.
Chicago Apparatus Co.
Corning Glass Works
Eimer & Amend
Fish-Schurman Co.
Fisher Scientific Co.
Kimble Glass Co.
Scientific Glass App.
Specialty Glass Co.

BOTTLES, Weighing
Ace Glass Inc.
Central Scientific Co.
Chicago Apparatus Co.
Eimer & Amend
Fish-Schurman Co.
Fisher Scientific Co.
Kimble Glass Co.
Scientific Glass App.
Specialty Glass Co.

BOXES, Ayrton Shunt
Shallcross Mfg. Co.

BOXES, Ratio
Cambridge Inst. Co.
Daven Co.
General Radio Co.
Ohmite Mfg. Co.
Rubicon Co.
Sensitive Research Inst.
Shallcross Mfg. Co.

BOXES, Resistance
American Automatic Elec.
Cambridge Inst. Co.
Chicago Apparatus Co.
Clough-Brengle Co.
Daven Co.
General Radio Co.
Meter Devices Co.
Muter Company
Rubicon Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
Triumph Mfg. Co.
Welch Mfg. Co.

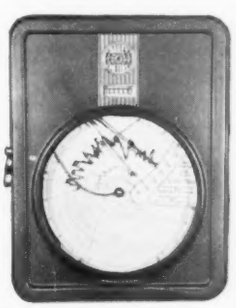
BOXES, Thermostat
Andrew, Victor J.
Thwing-Albert

BRAKE TESTING METER (See Testers, Brake)

BRIDGES, ELECTRICAL, A-c.
Andrew, Victor J.
Cambridge Inst. Co.
Clough-Brengle Co.
Daven Co.
Electronic Design Corp.
General Elec. Co.
General Radio Co.
Leeds & Northrup Co.
RCA Mfg. Co., Inc.
Rubicon Co.
Shallcross Mfg. Co.
Supreme Inst. Corp.
Tobe Deutschmann Corp.

BRIDGES, ELECTRICAL, Capacitance
Aerovox Corp.
Cambridge Inst. Co.
Central Scientific Co.
Clough-Brengle Co.
Electronic Design Corp.
General Elec. Co.
General Radio Co.
Industrial Inst. Inc.
Jackson Electrical Inst.
Leeds & Northrup Co.
RCA Manufacturing Co.
Rubicon Co.
Solar Mfg. Corp.
Tobe Deutschmann Corp.
Triplett Elec. Inst. Co.
Triumph Mfg. Co.

BRIDGES ELECTRICAL, Conductivity
Cambridge Inst. Co.
Central Scientific Co.
Industrial Inst. Inc.
Leeds & Northrup Co.
Rubicon Co.
Shallcross Mfg. Co.



BAILEY BOILER METER

● This dependable and accurate guide to maximum combustion economy is easily understood and followed by operators. It indicates, records and integrates Steam Flow from the boiler, records Air Flow supplied for combustion, and records Flue Gas Temperature.

Best combustion efficiency is secured by keeping Steam Flow and Air Flow pens together so that the records coincide one upon the other. The record of flue gas temperature when compared with that of Steam Flow shows the condition of baffles and tubes, and indicates heat absorption efficiency.

The Bailey Steam Flow-Air Flow Boiler Meter reduces fuel costs, lessens maintenance and outage, lowers standby costs and adds capacity. It is suitable for boiler plants operating units of 100 h.p. or more fired with stokers, pulverized coal, gas, oil or other fuels.

In order to obtain the maximum benefit from the Bailey Boiler Meter, it should be made an integral part of a Bailey Combustion Control System so that combustion losses are automatically corrected for even as they tend to appear.

For further details, refer to Sweet's Engineering Catalog or send for a copy of bulletin No. 46.

BAILEY METER COMPANY
1041 IVANHOE ROAD · CLEVELAND, O.
Bailey Meter Company Ltd., Montreal, Canada

STEEL PANELBOARDS

Steel Panelboards
Unit Control Panels
Steel Instrument Cubicles
Public Utility Cubicles
Streamline Machine Housings
Equipment Cabinets & Enclosures
Structural Steel Supports & Framework
Metal Cases and Boxes

★ These Falstrom Precision Built Steel Products are being used in Oil Refineries, Power Plants, Public Utilities, Process Industries, Communications Companies, etc., throughout the country. Send for Bulletins.

FALSTROM COMPANY
FALSTROM COURT. PASSAIC. NEW JERSEY

For addresses, see pages 66-76

Tool Cases...

RUECKERT QUALITY

COVERED, LINED, LACQUERED

A few nationally known concerns using our product for over a quarter of a century.

Brown and Sharpe Mfg. Co.
L. S. Starret Company
The Lufkin Rule Co.
Kueffel and Esser Co.
Federal Products Corporation
Taft Pierce Mfg. Co.
Millers Falls Company
National Electric Inst. Co.
Nicholson File Company
Casco Products Corp.
General Electric Company
The Bassick Co.

•

RUECKERT

MANUFACTURING COMPANY

69 Sprague St. Providence, R. I.

BRIDGES, ELECTRICAL, Hoopes
Leeds & Northrup Co.

BRIDGES, ELECTRICAL, Inductance
Andrew, Victor J.
Cambridge Inst. Co.
Daven Co.
General Radio Co.
Industrial Instr. Inc.
Leeds & Northrup Co.
Raytheon Mfg. Co.
RCA Mfg. Co., Inc.
Rubicon Co.
Triumph Mfg. Co.
United Transformer Corp.

BRIDGES, ELECTRICAL, Kelvin
Beck Bros.
Cambridge Inst. Co.
General Elec. Co.
Leeds & Northrup Co.
Rubicon Co.
Shallcross Mfg. Co.
Tagliabue Mfg. Co.

BRIDGES, ELECTRICAL, Limit
Rubicon Co.

BRIDGES, ELECTRICAL, Megohm
Associated Research, Inc.
Beck Bros.
Cambridge Instrument Co.
Clough Brengle Co.
General Radio Co.
Industrial Instruments
Leeds & Northrup Co.
Roller-Smith Co.
Shallcross Mfg. Co.
Triumph Mfg. Co.

BRIDGES, ELECTRICAL, Power-Factor
Cambridge Inst. Co.
Clough-Brengle Co.
General Electric Co.
General Radio Co.
Industrial Instruments
Leeds & Northrup Co.

BRIDGES, ELECTRICAL, Slide Wire
Beck Bros.
Cambridge Inst. Co.
Central Scientific Co.
Leeds & Northrup Co.
Meter Devices Co.
Roller-Smith Co.
Rubicon Co.
Shallcross Mfg. Co.
Sticht & Co.
Tagliabue Mfg. Co.
Welch Mfg. Co.

BRIDGES, ELECTRICAL, Vacuum Tube
Andrew, Victor J.
Central Scientific Co.
Electronic Prod. Co.
Fisher Scientific Co.
General Radio Co.
Shallcross Mfg. Co.
Televiso Co.
Triplett Elec. Inst. Co.
Triumph Mfg. Co.

BRIDGES, ELECTRICAL, Wheatstone
Beck Bros.
Cambridge Inst. Co.
Central Scientific Co.
Chicago Apparatus Co.
Daven Co.
General Elec. Co.
General Radio Co.
Industrial Inst. Inc.
Leeds & Northrup Co.
Muter Company
RCA Manufacturing Co.
Roller-Smith Co.
Rubicon Co.
Shallcross Mfg. Co.
Sticht & Co.
Tagliabue Mfg. Co.
Thwing-Albert Inst. Co.
Welch Mfg. Co.

B.T.U. INDICATORS
Central Scientific Co.
Cutler-Hammer, Inc.

BURETTES
Ace Glass Inc.
Central Scientific Co.
Eimer & Amend
Fish-Schurman Co.
Fisher Scientific Co.
Gaertner Scientific Corp.
Hays Corp.
Kimble Glass Co.
Macalaster Bicknell Co.
Machlett & Son
Microchemical Service
Rascher & Betzold
Sargent & Co.
Scientific Glass App. Co.
Scientific Instr. Co.
Specialty Glass Co.

CABINETS, for Electrical & Transmission Equip.
Faistrom Co.

CABLE TESTERS (See Testers, Cable)

CALIBRATING EQUIPMENT for Electrical Instruments & Meters
Associated Research, Inc.
Beck Bros.
Cambridge Instrument Co.
Commercial Engineering
Daven Co.
Eastern Specialty Co.
Electric Tachometer Corp.
Electrical Facilities, Inc.
Ferranti Electric, Inc.
General Electric Co.
Gray Instrument Co.
Hathaway Instrument Co.
(Continued)

CALIBRATING EQUIPMENT for Electrical Instruments & Meters
Leeds & Northrup Co.
Measurements Corp.
Premier Crystal Labs.
Roller-Smith Co.
Rubicon Co.
Shallcross Mfg. Co.
Standard Elect. Products
Standard Electric Time
Televiso Co.
Thwing-Albert Instrument
Western Electro-Mech.
Weston Electrical Inst.

CALIBRATING EQUIPMENT for Testing Machines
Commercial Engineering
Dillon & Co., Inc., W. C.
Hathaway Instrument Co.
Holz, Herman A.
Pittsburgh Instrument
Saxl Instrument Co.
Thwing-Albert Instrument

CALIPER RULES
Brown & Sharpe
Lufkin Rule Co.
Millers Falls Co.
Starrett Co., L. S.
Union Tool Co.
Weber Co.
Zeiss, Inc., Carl

CALIPERS, Indicating
Indicating Calipers Co.

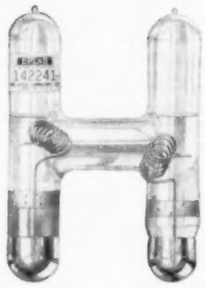
CALIPERS, Inside & Outside
Brown & Sharpe
Farrell-Birmingham (Large for Rolls)
Glogau & Co.
Indicating Calipers Co.
Lufkin Rule Co.
Millers Falls Co.
Park Sales
Scherr Co., Inc.
Starrett Co.
Union Tool Co.
Welch Mfg. Co.
Zeiss, Inc., Carl

CALIPERS, Square
Starrett Co.

CALORIMETERS, Adiabatic
Parr Instrument Co.

CALORIMETERS, Coal & Fuel
Central Scientific Co.
Emerson Apparatus Co.
Gaertner Scientific Corp.
Parr Instrument Co.
Welch Mfg. Co.
Precision Therm. & Inst.
Wilkens-Anderson Co.

EPPLEY



Standard Cells
Thermopiles
Pyrheliometers

EPLAB

THE EPPLEY LABORATORY, INC.

SCIENTIFIC INSTRUMENTS

NEWPORT, R.I.

U.S.A.

INDICATING CALIPERS

These Are Stock Indicating Calipers

Made In Two Capacities, 2" and 3"

The 2" Are Graduated in 1/100"
The 3" Are Graduated in 1/64"

Also in Metric System as Follows:

50 mm. Graduated in 1/5 mm.
75 mm. Graduated in 1/2 mm.

Send for Folder

We also make other calipers to order for special capacities, with arms shaped for measuring inaccessible sections of castings, etc.

Special Machine Work for Makers of Instruments and Apparatus. Estimates on Application.

INDICATING CALIPERS CORP.
506 EAST 19th STREET, NEW YORK, N. Y.
Cable Address: Indcaliper
TELEPHONE: GRAMERCY 5-1294

PARR INSTRUMENTS

Laboratories engaged in scientific research, industrial testing, and related fields are offered the latest developments and the best of construction in

CALORIMETERS
OXYGEN COMBUSTION BOMBS
PEROXIDE COMBUSTION BOMBS
CATALYTIC HYDROGENATION APPARATUS
MELTING POINT APPARATUS
FUEL TESTING EQUIPMENT
BOTTLED GAS VALVES
TURBIDIMETERS

Complete information may be readily obtained from leading dealers in scientific apparatus or direct from the factory.

At your service since 1899

PARR INSTRUMENT COMPANY · Moline, Ill.

For addresses, see pages 66-76

LIGHT
MEASURING
INSTRUMENTS

Colorimeters
Turbidimeters
Reflection Meters
Exposure Meters
Foot-Candle Meters
Densitometers
Vitamin Testers
Reflector Button Testers
Vacuum Tube Photometers
Abridged Spectrophotometers
Street Illumination Meters
Self-Generating Photocells

All types of special equipment involving light measurements furnished on order. Full cooperation in dealing with special light measuring problems.

Write for literature.

Photovolt Corporation

10 E. 40th STREET NEW YORK CITY

CLOCK
MOVEMENTS
for
RECORDING
INSTRUMENTS

High Grade 8 Day
and Motor Wound
Movements of Fine
Quality Built for
LONG LIFE

CHELSEA CLOCK CO.

300 Everett Ave., Chelsea, Mass.

ESTABLISHED 1886

CALORIMETERS, Gas
American Meter Co.
Central Scientific Co.
Connelly Iron Sponge
Cutler-Hammer, Inc.
Gaertner Scientific Corp.
Hays Corp.
Lambert Meter Co.
Precision Scientific Co.
Precision Ther. & Inst.
Wilkens-Anderson Co.

CALORIMETERS, Oxygen Bomb
Parr Instrument Co.

CALORIMETERS, Peroxide Bomb
Parr Instrument Co.

CALORIMETERS, Steam
Ellison Draft Gage Co.
Wilkens-Anderson Co.

CAMERAS, SCIENTIFIC
Baird Associates
Bausch & Lomb Opt.
Cambridge Inst. Co.
Electro-Medical Lab.
Fecker, J. W.
Hoffman Co., S. O.
Kern Co.
Mico Instrument Co.
Perkin-Elmer Corp.
Ruska & Co.
Zeiss, Inc., Carl

CAMERAS, SCIENTIFIC, Back Reflection
Hayes Scientific App.

CAMERAS, SCIENTIFIC, Diffraction
American Inst. Co.

CAMERAS, SCIENTIFIC, Motion Picture
Bell & Howell
Eastern Science Co.
Geophysical Inst. Co.

CAMERAS, SCIENTIFIC, Motion Picture X-Ray
American Askania Corp.

CAMERAS, SCIENTIFIC, Photo Micro (See Microscopes, Metallographic)

CAPACITANCE METERS
Andrew, Victor J.
Biddle Co., Jas. G.
Cambridge Inst. Co.
Clough-Brengle Co.
Electronic Design Corp.
General Elec. Co.
General Radio Co.
Jackson Electrical Inst.
Leeds & Northrup Co.
RCA Mfg. Co., Inc.
Rubicon Co.
Sickles Co.

CAPACITORS, Air
Andrew, Victor J.
Cambridge Inst. Co.
Cardwell Mfg. Corp.
General Radio Co.
Leeds & Northrup Co.

CAPACITORS, Electrolytic
Aerovox Corp.
Cornell Dubilier
Crowley & Co.
General Elec. Co.
Magnavox Co.
Potter Co.
Tobe Deutschmann Corp.

CAPACITORS, Mica
Cambridge Inst. Co.
Cornell Dubilier
General Elec. Co.
General Radio Co.
Industrial Inst. Inc.
RCA Manufacturing Co.
Leeds & Northrup Co.
Potter Co.
Rubicon Co.
Sangamo Electric Co.
Sickles Co.
Solar Mfg. Corp.

CAPACITORS, Paper
Aerovox Corp.
Cornell Dubilier
Tobe Deutschmann Corp.

CAPACITORS, Precision
Leeds & Northrup Co.

CAPACITORS, Variable
Cambridge Inst. Co.
Cardwell Mfg. Co.
General Radio Co.
Leeds & Northrup Co.
Millen Mfg. Co.
Rubicon Co.

CAPACITY METERS
Aerovox Corp.
Andrew, Victor J.
Bernard, H. J.
Clough-Brengle Co.
Hickok Elec. Inst. Co.
Industrial Inst. Inc.
Leeds & Northrup Co.
Premier Crystal Labs.
Radio City Products Co.
RCA Manufacturing Co.
Rubicon Co.
Solar Mfg. Corp.
Weston Elec. Inst. Corp.

CARBON DIOXIDE METERS (See Gas Analyzers, Carbon Dioxide)

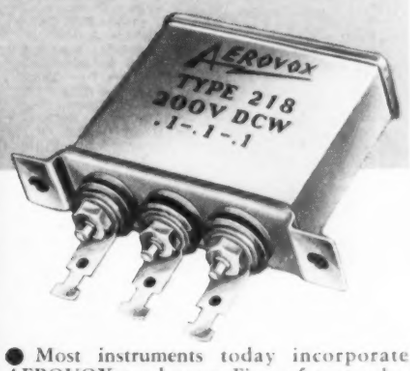
CARBON MONOXIDE METERS (See Gas Analyzers, Carbon Monoxide)

CARBON PILES (See Resistors, Carbon Compression)

CATHETOMETERS
American Askania Corp.
Cambridge Inst. Co.
Central Scientific Co.

(Continued)

CONDENSERS
truly fit for
INSTRUMENT-MAKER and USER



● Most instruments today incorporate AEROVOX condensers. First, of course, because they are dependable. But equally important is the wide choice of types and grades available. Whether it be the inexpensive servicing or shop instrument, or the costliest laboratory precision instrument, AEROVOX has the condenser that best meets the requirements of designer, maker, user.

STANDARD TYPES . . .
If economy is the prime consideration, there are the standard type Aerovox condensers. The general catalog contains every type of so-called radio condenser, carefully made yet available at mass-produced prices. These are the types serving daily in millions of radio sets, year after year, with a truly enviable record.

COMMERCIAL-GRADE . . .
If superlative performance and life are wanted, in keeping with the highest instrument standards, then Aerovox offers its so-called commercial-grade line of paper, oil, mica and electrolytic condensers identical with those heretofore made to order for the Government, commercial-communication and other critical buyers.

MADE-TO-ORDER . . .
Lastly, if your needs are entirely special, then Aerovox will work with you in developing special and exclusive types. Years of experience in condensers fitted to difficult jobs, is at your disposal.

Consult Us . . .
Submit your condenser problem for engineering collaboration, specs., quotations. Our latest literature is yours for the asking.

AEROVOX
CORPORATION
NEW BEDFORD, MASS.
IN CANADA: AEROVOX CANADA Limited Hamilton, Ont.

For addresses, see pages 66-76

Controllers FOR AUTOMATIC REGULATION OF TEMPERATURE, COMBUSTION, pH, ETC

Micromax Electric and Pneumatic Controllers are available in models to suit any requirement. Equipment can be shipped as an assembled unit for quick, easy installation.

Metermax Combustion Control is a unit system which automatically proportions fuel and air for efficient combustion in boiler and industrial furnaces.

Send us details of any problem in control of temperature, combustion, frequency, chemical concentration, etc.

LEEDS & NORTHRUP CO.
4984 STENTON AVENUE, PHILADELPHIA

MEASURING INSTRUMENTS · TELEMETERS · AUTOMATIC CONTROLS · HEAT-TREATING FURNACES

CATHETOMETERS (Continued)
Ferner Co.
Fuess, Inc.
Gaertner Scientific Corp.
Mico Instrument Co.

CATHODE RAY TUBES (See Oscillographs, Cathode Ray)

CELLS, Concentration
Fish-Schurman Corp.
Leeds & Northrup Co.
Zeiss, Inc.

CELLS, Conductivity, Electrical
Allied Controls Co.
Cambridge Instrument Co.
Central Scientific Co.
Coleman Electric Co.
Fisher Scientific Co.
Fredericks, George
Gray Instrument Co.
Industrial Instruments
Leeds & Northrup Co.
Sargent & Co.
Scientific Glass App.

CELLS, Conductivity, Thermal
Cambridge Instrument Co.
Central Scientific Co.
Gow-Mac Instrument Co.
Lantz-Phelps Corp.
Leeds & Northrup Co.

CELLS, Kerr
Batcher, Ralph R.
General Physical Lab.

CELLS, Photoelectric
Bradley Labs.
Burt Scientific Labs.
Continental Elec. Co.
De Jur-Amsco Corp.
Eby, Inc.
Electronic Lab.
Electronic Prod. Co.
Fredericks, George
General Elec. Co.
General Scientific Corp.
G-M Labs.
Hickok Elec. Inst. Co.
Lumenite Elec. Co.
Luxtrol Co., Inc.
Pfaltz & Bauer, Inc.
Photobell Corp.
Photovolt Corp.
RCA Manufacturing Co.
Rehtron Corp.
Rhamstine, J. Thos.
United Cinephone Corp.
Vacutron, Inc.
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.

CELLS, Standard
Cambridge Inst. Co.
Eppley Lab.
Leeds & Northrup Co.
Rubicon Co.
Tagliabue Mfg. Co.
Thwing-Albert
Weston Elec. Inst. Corp.

CEMENT APPARATUS (See Testers & Testing Machines, Cement)

CEMENTING GAGES (See Gages, Cementing)

CEMENT MOLDS
Central Scientific Co.
Fisher Scientific Co.
Humboldt Mfg. Co.
Precision Scientific Co.
Standard Concrete App.

CEMENT NEEDLE APPARATUS
Fisher Scientific Co.
Humboldt Mfg. Co.

CENTRIFUGES
Clay-Adams Co.
Fisher Scientific Co.
Sargent & Co.
Williams Apparatus Co.

CENTRIFUGES, Paper Testing
Williams Apparatus Co.

CENTRIFUGES, Oil Testing
Boekel & Co.
Braun Corp.
Central Scientific Co.
Eclipse Aviation
International Equip.
Moeller Inst. Co.
Precision Scientific Co.
Tagliabue Mfg. Co.
Thomas Co., Arthur H.
Western Machinery Co.
Westinghouse Elec. & Mfg.

CHAINS, SURVEYOR'S (See Surveying Instruments)

CHECKERS, RADIO TUBE (See Analyzers, Radio Set)

CHEMICAL FEEDERS, Automatic pH Control
Electronic Prod. Co.
Everson Mfg. Co.
International Filter Co.
Leeds & Northrup Co.
Syntron Company
Tagliabue Mfg. Co.
Wallace & Tiernan

CHEMICAL FEEDERS, Dry & Liquid
Builders Iron Foundry
Cochrane Corp.
Colloid Equip. Co.
Fischer & Porter
Gump Co., B. F.
International Filter Co.
Jeffrey Mfg. Co.
Mine & Smelter Sup. Co.
Omega Machine Co.
Richardson Scale Co.
Syntron Company
Wallace & Tiernan Prod.

CHEMICAL PORCELAIN (See Porcelain, Laboratory)

CHLORINE CONTROL APPARATUS (See Controllers, Automatic, Chlorine)

CHLORINE TESTING APPARATUS (See Testers, Chlorine)

CHOKES
Andrew, Victor J.
Annis Co.
Clough-Brengle Co.
Martin Decker Corp.
Ohmite Mfg. Co.
Raytheon Mfg. Co.
Sickles Co.
Thordarson Elec. Co.
United Transformer Corp.

CHOKES, Precision metering, for flowtests on oilwells
Ruska & Co., Inc.

CHRONOGRAPHS
American Inst. Co.
Aristo Import Co.
Burke, Louis
Cambridge Inst. Co.
Ducommun Co.
Electro-Medical Lab.
Esterline-Angus Co.
Fecker, J. W.
Gaertner Scientific Corp.
Jaeger Watch Co.
Jardur Import Co.
Pierce Watch Co.
Precision Ther. & Inst.

CHRONOMETERS (See Watches)

CLASSIFIERS, Particle Size, Air
Colloid Equip. Co.
Federal Pneumatic Sys.

CLINOGRAPHS, Bore Hole
Geophysical Inst. Co.
Sperry-Sun Well Survey'g

CLINOMETERS, Ship
Kuner Co., Max
Moeller Inst. Co.

CLOCKS, Master
Cincinnati Time Rec. Co.
Gaertner Scientific Corp.
General Elec. Co.
Howard Clock Products
International Bus. Mach.
Paragon Electric Co.
Standard Elec. Time
Stromberg Electric Co.
Thomas Clock Co.
Warren Telechron Co.
Zenith Electric Co.

CLOCKS, Minute Impulse & Synchronous
Cincinnati Time Rec. Co.
Cramer & Co., Inc.
Elec. Tachometer Corp.
General Elec. Co.
Howard Clock Products
International Bus. Mach.
Paragon Electric Co.
Standard Elec. Time Co.
Stromberg Electric Co.
Thomas Clock Co.
Warren Telechron Co.
Zenith Electric Co.

CLOCKS, Primary
Cincinnati Time Rec. Co.
General Elec. Co.
Howard Clock Products
International Bus. Mach.
Stromberg Electric Co.
Thomas Clock Co.

CLOCKS, Secondary
American Automatic Elec.
Cincinnati Time Rec. Co.
General Elec. Co.
Howard Clock Products
International Bus. Mach.
Standard Elec. Time
Stromberg Electric Co.
Thomas Clock Co.

CLOCKS, Standard
Gaertner Scientific Corp.
Jaeger Watch Co.
Kolisman Inst. Co.
Standard Elec. Time

CLOCKS, Stop
Central Scientific Co.
Fish-Schurman Co.
Glogau & Co.
Jaeger Watch Co.
Paragon Electric Co.
Standard Elec. Time
Tagliabue Mfg. Co.
Thompson Clock Co.
Warren Telechron Co.

CLOUD & POUR TEST APPARATUS
Ace Glass Inc.
American Inst. Co.
Central Scientific Co.
Corning Glass Works
Fisher Scientific Co.
Humboldt Mfg. Co.
Moeller Inst. Co.
Ruehfel Co.
Scientific Inst. Co.
Tagliabue Mfg. Co.
Western Machinery Co.

COAL METERS
Bailey Meter Co.
Northern Equip. Co.

COIL TESTING EQUIPMENTS (See Testers, Coil)

COLLIMATORS, Vertical
Fecker, J. W.
Pioneer Instrument Co.
White Co., Inc.

COLOR ANALYZERS, Photoelectric
Akatos, Inc.
Bausch & Lomb Optical
Central Scientific Co.
Eimer & Amend
Electric Sorting Mach.
Electronic Laboratory
Electronic Prod. Co.
Ess Inst. Co.
Fisher Scientific Co.
Gaertner Scientific Corp.
General Elec. Co.
General Radio Co.
Jarrell-Ash Co.
Klett Mfg. Co.
Luxtrol Co., Inc.
Pfaltz & Bauer, Inc.
Photobell Corp.
Pho-Tron Inst. Co.
Rawson Elec. Inst. Co.
Rubicon Co.
Saxl Instrument Co.
Sheldon Electric Corp.
United Cinephone Corp.
Woermann-Schuchhardt

COLOR COMPARATORS, Photoelectric (See Color Analyzers, Photoelectric)

COLOR COMPARATORS, Visual
Akatos, Inc.
Baird Associates
Bausch & Lomb Optical
Central Scientific Co.
Electronic Research Labs.
Fischer & Porter Co. (Cells only)
Fisher Scientific Co.
Gaertner Scientific Corp.
Hellige, Inc.
Jarrell-Ash Co.
LaMotte Chemical Prod.
Leitz, Inc.
Luxtrol Co., Inc.
Munsell Color Co.
Rascher & Betzold
Saxl Instrument Co.
Tagliabue Mfg. Co.
Taylor & Co., Inc., W. A.
United Cinephone Corp.
Zeiss, Inc., Carl

COLOR GRADERS (See Color Analyzers, Photoelectric)

COLOR MATCHING OUTFITS (See Color Comparators, Visual)

COLORIMETER TUBES (See Colorimeters, Visual)

COLORIMETERS, Photoelectric
American Inst Co.
Central Scientific Co.
Electronic Prod. Co.
Frober-Faybor Co.
General Elec. Co.
Higgins, Charles F.
Jarrell-Ash Co.
Klett Mfg. Co.
Luxtrol Co., Inc.
Pfaltz & Bauer, Inc.
Photobell Corp.
Photovolt Corp.
Pho-Tron Inst. Co.
Rubicon Co.
Saxl Instrument Co.
Scientific Glass App.
United Cinephone Corp.
Woermann-Schuchhardt

COLORIMETERS, Visual
Akatos, Inc.
American Inst. Co.
Bausch & Lomb Optical
Central Scientific Co.
Electronic Research Labs.
Fisher Scientific Co.
Jarrell-Ash Co.
Klett Mfg. Co.
Leitz, Inc.
Munsell Color Co.
Rascher & Betzold
Saxl Instrument Co.
Spencer Lens Co.
Tagliabue Mfg. Co.
Zeiss, Inc., Carl

COMBUSTION, Indicators and Recorders (See Gas Analyzers, Boiler Meters, etc.)

COMBUSTION CONTROL EQUIPMENT (See Controllers, Automatic-Combustion)

COMMUNICATION MEASURING INSTRUMENTS
American Automatic Elec.
Andrew, Victor J.
Ballantine Labs.
Bernard, H. J.
Brush Development Co.
Clough-Brengle Co.
Daven Co.
Elec. Indicator Co.
Ferris Inst. Corp.
General Elec. Co.
Hickok Elec. Inst. Co.
Industrial Inst. Inc.
Jones-Orme Co.
Leeds & Northrup Co.
Measurements Corp.
RCA Manufacturing Co.
Rubicon Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
Weston Elec. Inst. Corp.

COMPARATORS, Mechanical
Farrel-Birmingham (Gear Tooth)
Federal Prod. Corp.
Ferner Co.
Gaertner Scientific
Hathaway Inst. Co.
Mico Instrument Co.
Park Sales
Pratt & Whitney
Scherr Co., Inc.
Standard Gage
Wilder, R. S.

COMPARATORS, Optical
Applied Research Labs.
Bausch & Lomb Optical
Cambridge Inst. Co.
Electronic Research Labs.
Ess Inst. Co.
Jones & Lamson Mach.
Leitz, Inc.
Scherr Co., Inc.
Spencer Lens Co.
United Cinephone Corp.
Van Keuren Co.
Zeiss, Inc., Carl

COMPASSES, Aircraft
American Askania Corp.
Elgin Natl. Watch Co.
Kolisman Inst. Co.
Moisture Register Co.
Pioneer Instrument Co.
RCA Manufacturing Co.
Star Compass Co.

COMPASSES, Automobile
Star Compass Co.
U. S. Gauge Co.

COMPASSES, Azimuth
Ainsworth & Sons
Keuffel & Esser Co.
Leupold, Volpel & Co.
Pioneer Instrument Co.
Warren-Knight Co.

COMPASSES, Dip
Gurley, W. & L. E.
Keuffel & Esser Co.
Taylor Inst. Cos.
Warren-Knight Co.

COMPASSES, Drafting Room (See Drawing Instruments)

COMPASSES, Gyro
Sperry Gyroscope Co.

COMPASSES, Magnetic
Ainsworth & Sons
Baker Compass Co.
Geophysical Inst. Co.
Gurley, W. & L. E.
Keuffel & Esser Co.
Kolisman Inst. Co.
Leupold, Volpel & Co.
Negus, T. S. & J. D.
Pioneer Instrument Co.
Star Compass Co.
Taylor Inst. Cos.
Testrite Instrument Co.
Warren-Knight Co.

COMPASSES, Marine
American Askania Corp.
Baker Compass Co.
Bendix Marine Products
Bliss & Co.
Geophysical Inst. Co.
Kuner Co., Max
Marine-Compass Co.
Negus, T. S. & J. D.
Star Compass Co.

COMPASSES, Radio
Hickok Elec. Inst. Co.
RCA Manufacturing Co.
Triumph Mfg. Co.

COMPASSES, Ship (See Compasses, Marine)

COMPASSES, Telltale (See Compasses, Marine)

COMPENSATION, Magnetic
Geophysical Inst. Co.

COMPOSING TYPEWRITERS
Coxhead Corp.

CONCENTRATION RECORDERS
Leeds & Northrup

CONDENSER, Electric (See Capacitors)

CONDENSER LEAKAGE, Indicators
Associated Research
Clough-Brengle Co.
Electronic Design Corp.
Hickok Elec. Inst. Co.
Industrial Inst. Inc.
Jackson Electrical Inst.
Leeds & Northrup Co.
Potter Co.
Radio City Products Co.
Rawson Elec. Inst. Co.
Tobe Deutschmann Corp.
Triumph Mfg. Co.
Weston Elec. Inst. Corp.

CONDENSER LEAKAGE, Recorders
Esterline-Angus Co.
Leeds & Northrup

CONDENSER TESTERS (See Testers, Condenser)

CONDUCTIVITY METERS
Allis-Chalmers Mfg. Co
Central Scientific Co
Coleman Electric Co.
Electronic Prod. Co.
Esterline-Angus Co.
Industrial Inst. Inc.

(Continued)

PRECISION COMBUSTION

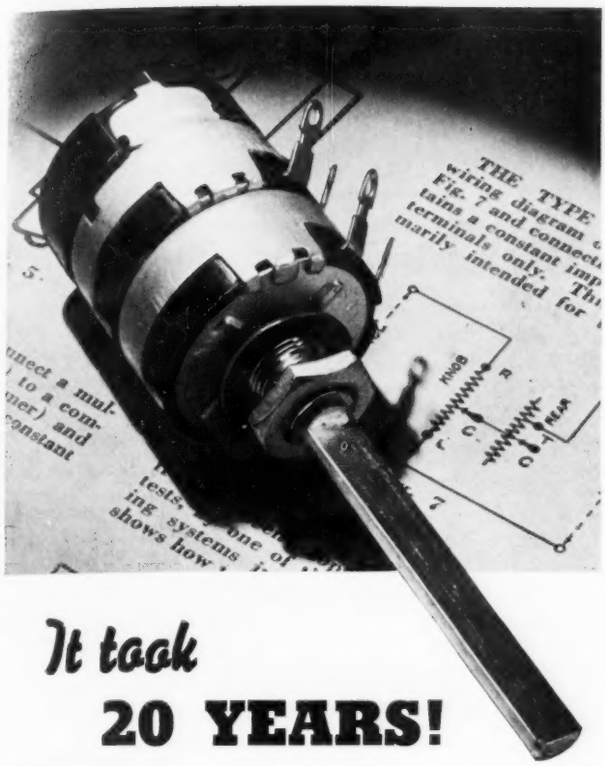
REQUIRES INSTANTANEOUS, SENSITIVE, INFORMATION

The HAZEGAGE "Electric Eye" Combustion Indicator is the *fastest* instrument on many modern panel boards. It enables automatic controls to be set *more precisely*—often on ten-second information.

It *notifies* firemen when "out of bounds"

Ess Instrument Company
30 Irving Place, N.Y.C.

For addresses, see pages 66-76



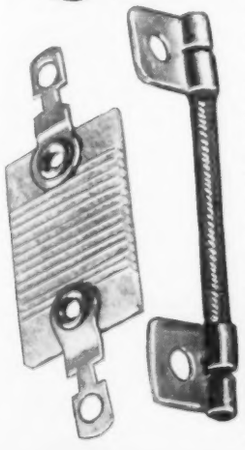
It took 20 YEARS!

★ During the past two decades, Clarostat specialists have wound *billions* of feet of resistance wire — from half the thickness of human hair, on up to the large wire sizes. They have made *millions of carbon-element controls.* They have worked closely with the most critical users of such components, including *leading instrument makers.*

Such experience is vitally important to you. More than so much bakelite or wire, metal or cement, claim or counter-claim, this backing determines the true worth of any resistor or control. So remember, 20 *long, hard, vital* years!

CONTROLS . . .

Clarostat offers the widest choice of controls in both wire-wound and composition-element types. All resistance values, tapers, taps, shafts, terminals, combinations. The recently-introduced Clarostat Power Rheostat has already won widespread acceptance in radio and aircraft equipment, because of its extraordinary electrical and mechanical ruggedness.



RESISTORS . . .

Complete line of wire-wound resistors in all types, sizes, values. Greenohm inorganic-cement-coated power resistors are now standard in better-grade instruments. Flexible resistors with cotton, silk or fibreglass insulation, are widely employed in fine instruments. Special resistors such as three typical examples shown at left, made to order in any quantities to meet any schedule. Clarostat winding facilities are *second to none.*

BALLASTS . . .

For automatic regulation of line voltage, for voltage-dropping purposes, for bleeder networks, Clarostat offers widest range of convenient units in perforated cases and in metal-tube-type housings, with any desired bases or terminals.

Consult Us . . .

Be sure you have our loose-leaf engineering data in your working library. Yours for the asking. Meanwhile, consult us regarding any resistance or control problem. Recommendations, specifications, quotations, samples, to responsible parties.

CLAROSTAT *Manufacturing Co. Inc.*
285-287 NORTH SIXTH STREET
BROOKLYN, NEW YORK, U.S.A.
• OFFICES IN PRINCIPAL CITIES •

YOU CAN GET

NOT 1 BUT 5

FORMS OF CONTROL

in the New Taylor Fulscope Controller

Industry's 5-in-1 controller for temperature, pressure, flow, liquid level

•

In this one instrument these five forms of control are available

•

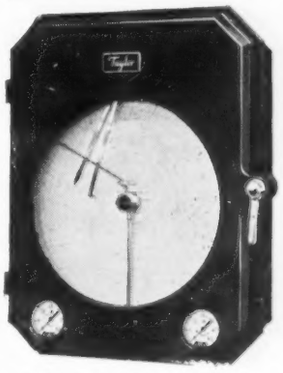
Fixed high sensitivity—for on-and-off control on applications where you have small time lags and large capacities, regardless of load changes.

•

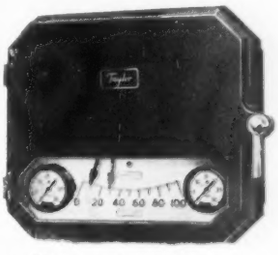
Adjustable sensitivity—for throttling control on applications with a wide range of time lags and capacities, where there are infrequent or minor load changes.

•

Adjustable sensitivity with automatic reset (in same case) for precision control on applications with a wide range of time lags and capacities, and gradual, sustained load changes.



• *The new Taylor Fulscope Recording Controller. Universal case drilled and tapped to accommodate not 1 but 5 forms of process control. One or two complete control mechanisms.*



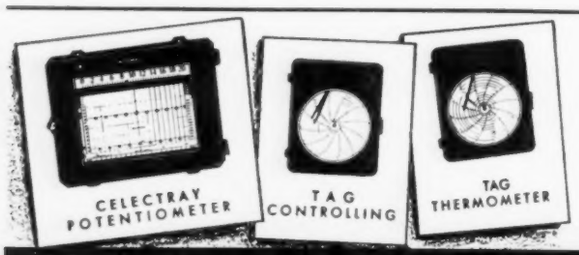
• *The new Taylor Fulscope—Indicating Type. Features same as Recording Type, but controls and indicates only one variable.*

Adjustable sensitivity with Pre-Act—the extraordinary new control effect introduced by Taylor, which is based on the *rate* of control-point deviation. For applications with a wide range of time lags and capacities, and sudden, momentary disturbances *without* sustained load changes.

Adjustable sensitivity with automatic reset and Pre-Act—for ultimate precision control on complicated applications involving a wide range of time lags and capacities *with* sudden, sustained load changes.

• • •

Write for complete information and catalogs to Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada.



TAG RECORDERS

These instruments are designed to record all temperatures from minus 200°C. up, and all industrial pressures. Ask for Catalogs—They graphically suggest the usefulness of TAG TEMPERATURE RECORDERS and PRESSURE RECORDERS for service and economy in your plant.

C. J. TAGLIABUE MFG. CO.
Park & Nostrand Avenues, Brooklyn, N. Y.

LOOK INSIDE the COVER (Part 1) For a COMPLETE LIST of TAG INSTRUMENTS TAG

CONDUCTIVITY METERS (Continued)
Leeds & Northrup Co.
Natl. Aluminate Corp.
Rubicon Co.
Sensitive Research Inst.
Shallcross Mfg. Co.

CONES, Pyrometric
Accurate Pyrometric Cone
Fish-Schurman Co.
Henderson & Co.
Orton Jr. Ceramic F'd'n

CONES, Slump
Central Scientific Co.
Humboldt Mfg. Co.
Precision Scientific Co.
Riehle Div.

CONNECTORS, Plugs, Clips, Posts, Jacks
Am. Automatic Electric
American Inst. Co.
Autocall Co.
Clare & Co.
Eby, Inc.
General Radio Co.
Kellogg Switchboard
Meter Devices Co.
Shallcross Mfg. Co.

CONSISTENCY REGULATORS, Pulp & Paper (See Controllers, Automatic, Consistency

CONSTANT SPEED and Frequency Sets
Andrew, Victor J.
Elec. Tachometer Corp.
Gaertner Scientific Corp.
General Elec. Co.
Pioneer Instrument
United Cinephone Corp.
Westinghouse Elec. & Mfg.

CONTOUR MEASURING PROJECTORS
Bausch & Lomb Optical
Leitz, Inc.
Scherr Co., Inc.

"CONTROL" — NOTE —

The following pages deserve close study. Note for example that after numerous "Controllers, Automatic" there are three classes of "Controllers, Manual." Look up also under "Regulators" for many types thus termed by usage. Also "Thermostats" and other commonly-used names of specific-purpose automatic controllers.

As a rule, Automatic Controllers are "instrument-like" while devices known as Controls (preceded by name of application) are simple, single-purpose devices.

CONTROL DRIVES (See Servo-Motors)

CONTROLS, AUTOMATIC (See Controllers, Automatic)

CONTROLLERS, AUTOMATIC (See also object of Measurement and Control)

CONTROLLERS, AUTOMATIC, Ammonia (See Ammonia Control Equipment)

CONTROLLERS, AUTOMATIC, Beater (See Controllers, Automatic, Consistency)

CONTROLLERS, AUTOMATIC, Boiler Feed
Atlas Valve Co.
Bailey Meter Co.
Consol. Ashcroft-Hancock
Fisher Governor
Foster Engg. Co.
Foxboro Co.
Henszey Co.
Kiely & Mueller
Mason-Neilan Regulator
McDonnell & Miller
Mercon Regulator Co.
Natural Gas Equipment
Northern Equip. Co.
Republic Flow Meters Co.
Robertshaw Thermostat
Ruggles-Klingemann
Watts Regulator Co.
Wilgus Mfg. Co.

CONTROLLERS, AUTOMATIC, Boiler Water Concentration
Cochrane Corp.
Henszey Co.
Leeds & Northrup Co.
Republic Flow Meters Co.
Fischer & Porter

CONTROLLERS, AUTOMATIC, Bulk Material Level
Bin-Dicator Co.

CONTROLLERS, AUTOMATIC, Chlorine
Arca Regulators, Inc.
Askania Regulator Co.
Builders Iron Foundry
(Continued)

CONTROLLERS, AUTOMATIC, Chlorine (Continued)
Everson Mfg. Co.
LaMotte Chemical Prod.
National Meter Co.
Rascher & Betzold
Victor Equipment Co.
Wallace & Tiernan

CONTROLLERS, AUTOMATIC, Combustion
Arca Regulators, Inc.
Askania Regulator Co.
Bailey Meter Co.
Brooke Eng. Co.
Brown Inst. Co.
Cambridge Inst. Co.
Cash Co.
Consulting & Engineering
Denver Fire Clay Co.
General Combustion Corp.
General Regulator Corp.
Hagan Corp.
Hays Corp.
Lantz-Phelps Corp.
Leeds & Northrup Co.
Mason-Neilan Reg. Co.
Minneapolis-Honeywell
National Airoil Burner
National Brass Co.
Natural Gas Equipment
Republic Flow Meters
Selas Company

CONTROLLERS, AUTOMATIC, Condensation
Bailey Meter Co.
Boylston Co.
Fisher Governor Co.
Friez & Sons
General Regulator Corp.
Industrial Instrument Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.

CONTROLLERS, AUTOMATIC, Condenser Leakage
Leeds & Northrup Co.

CONTROLLERS, AUTOMATIC, Consistency
Brabender Corp.
Bristol Co.
D'Este Co.
Foxboro Co.
Green, Arthur B.
Mason-Neilan Regulator
Merritt Engr. & Sales
Northern Equip. Co.
Process Contros, Inc.

CONTROLLERS, AUTOMATIC, Counting
Bristol Co.
Eagle Signal Corp.
Industrial Instrument Co.
Lumenite Electric Co.
Standard Electric Time
United Cinephone Corp.

CONTROLLERS, AUTOMATIC, Current (See Regulators)

CONTROLLERS, AUTOMATIC, Cycle
Autocall Co.
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Cramer & Co., Inc.
Denver Fire Clay Co.
Elec. Switch Corp.
Fisher Governor
Foxboro Co.
Hagan Corp.
Hanlon-Waters, Inc.
Industrial Instrument Co.
Industrial Timer Corp.
Leeds & Northrup Co.
(Continued)

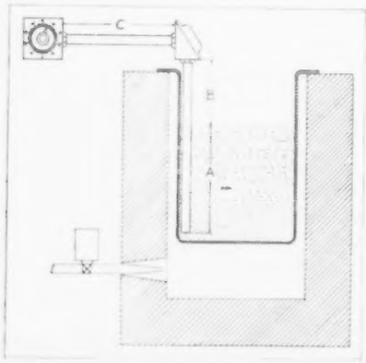
CONTROLLERS, AUTOMATIC, Cycle (Continued)
Mason-Neilan Reg. Co.
Minneapolis-Honeywell
Monitor Controller Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.

CONTROLLERS, AUTOMATIC, Damper
Arca Regulators, Inc.
Askania Regulator Co.
Atlas Valve Co.
Bailey Meter Co.
Barber-Coleman Co.
Bristol Co.
Brooke Eng. Co.
Brown Inst. Co.
Cash Co.
Cook Electric Co.
Davis Reg. Co.
Denver Fire Clay Co.
Detroit Lubricator Co.
Electronic Prod. Co.
Fisher Governor
Foster Eng. Co.
Foxboro Corp.
Friez & Sons, Julien
Gleason-Avery, Inc.
Hagan Corp.
Hanlon-Waters, Inc.
Hays Corp.
Johnson Service Co.
Kiely & Mueller
Leeds & Northrup Co.
Mason-Neilan Regulator
Minneapolis-Honeywell
National Airoil Burner
Natural Gas Equipment
Penn Electric Switch Co.
Powers Regulator Co.
(Continued)

BURLING

HEAT CONTROLS
RAPID • ACCURATE

NEW Temperature Control Angle Fitting
keeps instrument away from heat and out of the way of the work.



Cut shows model D installed in Metal Pot or Salt Bath. A turn of the outside knob changes the temperature setting instantly.

Dimension A usually 7½, 8½ or 13 in.

B and C can be varied to suit.

Temperatures — 100 to 1400 deg. F.

BURLING INSTRUMENT CO.
251-253 SPRINGFIELD AVENUE NEWARK, N. J.

COMPLETE INSTRUMENTATION

for **INDUSTRIAL PROCESSES**

CONTROLLERS for temperature, pressure, absolute pressure, rate of flow and liquid level. Air-operated potentiometer controllers. Exclusive features resulting in unexcelled performance.

RECORDERS of temperature, pressure, flow level, motion, absolute pressure.

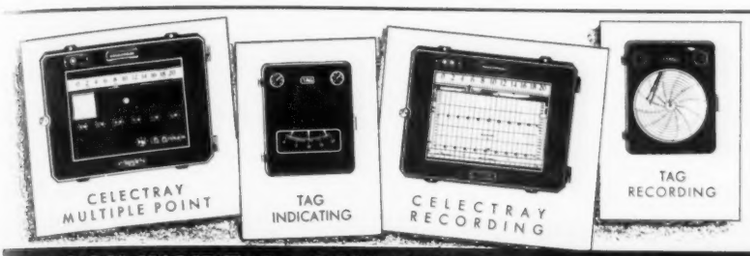
INDICATORS of temperature, pressure, flow and level.

TRANSMISSION SYSTEMS, pneumatic type with exceptionally fast response. Electric signalling systems.

MASONEILAN

MASON-NEILAN REGULATOR CO.
1185 ADAMS ST., BOSTON, MASS., U. S. A.

For addresses, see pages 66-76



TAG CONTROLLERS

Wherever the control of plant operations presents a production problem, TAG Automatic Controllers of either the electrical or air-operated types offer competent solution. These TAG Instruments have opened the way to better processing methods by more precise control of temperature, pressure and the time in which they act. Write for catalogs.

C. J. TAGLIABUE MFG. CO.
Park & Nostrand Avenues, Brooklyn, N. Y.

LOOK INSIDE the COVER (Part 1) *For a* COMPLETE LIST *of* TAG INSTRUMENTS TAG

CONTROLLERS, AUTOMATIC DAMPER (Continued)
Preferred Utilities Mfg.
Republic Flow Meters
Ruggles-Klingemann
Schade Valve Mfg. Co.
Spence Eng. Co., Inc.
Tagliabue Mfg. Co.
Watts Regulator Co.
White-Rodgers Electric
Wilgus Mfg. Co.

CONTROLLERS, AUTOMATIC, Density
Acme Regulator Co.
Arca Regulators, Inc.
Automatic Valve Control
Lumenite Electric Co.
Mine & Smelter Supply
Tagliabue Mfg. Co., C. J.
Taylor Instrument Cos.

CONTROLLERS, AUTOMATIC, Desuperheat
Arca Regulators, Inc.
Askania Regulator Co.
Atlas Valve Co.
Bailey Meter Co.
Brown Inst. Co.
Foxboro Corp.
Hagan Corp.
Leeds & Northrup Co.
Mason-Neilan Regulator
Mercon Regulator Co.
Northern Equip. Co.
Republic Flow Meters Co.
Spence Eng. Co., Inc.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Trerice Co.

CONTROLLERS, AUTOMATIC, Draft
Arca Regulators, Inc.
Askania Regulator Co.
Atlas Valve Co.
Bailey Meter Co.
Barber-Coleman Co.
Boiler Room Equip.
Bristol Co.
Brooke Eng. Co.
Brown Inst. Co.
Cash Co.
Denver Fire Clay Co.
Foster Eng. Co.
Foxboro Co.
Friez & Sons, Julien
General Regulator Corp.
Gleason-Avery, Inc.
Hagan Corp.
Hays Corp.
Leeds & Northrup Co.
Mason-Neilan Regulator
Minneapolis-Honeywell
National Airoil Burner
National Brass Co.
Preferred Utilities Mfg.
Republic Flow Meters
Ruggles-Klingemann
Tagliabue Mfg. Co.
Taylor Inst. Cos.

CONTROLLERS, AUTOMATIC, Feed Water
Askania Regulator Co.
Atlas Valve Co.
Bailey Meter Co.
Consol. Ashcroft-Hancock
Fisher Governor
Hagan Corp.
(Cont'd)

CONTROLLERS, AUTOMATIC, Feed Water (Continued)
Hanlon-Waters, Inc.
Henszey Co.
Kiely & Mueller
Mason-Neilan Reg. Co.
McAlear Mfg. Co.
McDonnell & Miller
Mercon Regulator Co.
Natural Gas Equipment
Northern Equip. Co.
Republic Flow Meters
Ruggles-Klingemann
Schade Valve Mfg. Co.
Simplex Valve & Meter
Watts Regulator Co.
Wilgus Mfg. Co.

CONTROLLERS, AUTOMATIC, Filter Rate
Cochrane Corp.
International Filter Co.
Mason-Neilan Reg. Co.
Taylor Inst. Cos.

CONTROLLERS, AUTOMATIC, Float
Allen-Bradley Co.
Autocall Co.
Automatic Control Co.
Automatic Temp. Control
Bailey Meter Co.
Cash Co.
Cochrane Corp.
Cutler-Hammer, Inc.
Davis Regulator Co.
Detroit Lubricator Co.
Fisher Governor
(Cont'd)

CONTROLLERS, AUTOMATIC, Float (Continued)
Furnas Electric Co.
Foster Engg. Co.
Foxboro Co.
Frick Co.
Hagan Corp.
Hanlon-Waters, Inc.
Kiely & Mueller
Mason-Neilan Regulator
McAlear Mfg. Co.
Mercon Regulator Co.
Penn Electric Switch
Powers Regulator Co.
Ruggles-Klingemann
Schade Valve Mfg. Co.
Simplex Valve & Meter
Spence Eng. Co., Inc.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Water Level Controls Co.

CONTROLLERS, AUTOMATIC, Flow
American Meter Co.
Arca Regulators
Askania Regulator
Bailey Meter Co.
Brown Inst. Co.
Bristol Co.
Cash Co.
Denver Fire Clay Co.
Electrimatic Corp.
Fischer & Porter
Foster Engg. Co.
Foxboro Co.
General Regulator Corp.
Hagan Corp.
(Cont'd)

CONTROLLERS, AUTOMATIC, Flow (Continued)
Hanlon-Waters, Inc.
International Filter Co.
Leeds & Northrup Co.
Mason-Neilan Regulator
McAlear Mfg. Co.
Mercon Regulator Co.
Process Controls, Inc.
Republic Flow Meters
Simplex Valve & Meter
Spence Eng. Co., Inc.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Victor Equipment Co.
Wilgus Mfg. Co.

CONTROLLERS, AUTOMATIC, Flow Proportioning
American Meter Co.
Arca Regulators, Inc.
Askania Regulator Co.
Autocall Co.
Automatic Temp. Control
Bailey Meter Co.
Barber-Coleman Co.
Bristol Co.
Brooke Eng. Co.
Brown Inst. Co.
Builders Iron Foundry
Cash Co.
Cochrane Corp.
Cutler-Hammer, Inc.
Electronic Prod. Co.
Fischer & Porter
Foxboro Co.
General Regulator Corp.
(Cont'd)

CONTROLLERS, AUTOMATIC, Flow Proportioning (Continued)
Hagan Corp.
Hanlon-Waters, Inc.
Henszey Co.
Illinois Engr. Co.
International Filter Co.
Lammert & Mann Co.
Mason-Neilan Regulator
McAlear Mfg. Co.
Mercon Regulator Co.
Republic Flow Meters Co.
Reynolds Gas Regulator
Simplex Valve & Meter
Spence Engr. Co., Inc.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Vergilio Co.
Victor Equipment Co.
Wheelco Inst. Co.

CONTROLLERS, AUTOMATIC, Fluid Proportioning
(See Controllers, Automatic, Flow Proportioning)

CONTROLLERS, AUTOMATIC, Frequency
(See Regulators)

CONTROLLERS, AUTOMATIC, Furnace
Am. Gas Furnace Co.
Arca Regulators, Inc.
Askania Regulator Co.
Automatic Elec. Mfg. Co.
Automatic Temp. Control
Bailey Meter Co.
(Cont'd)

Bailey FEED WATER Control

● Bailey Meter Company offers three distinct feed water control systems. They are (1) the Thermo-hydraulic Feed Water Regulator which is suitable for the majority of small boilers operating at relatively low pressures. This regulator operates from water level alone and is provided with a fully balanced tight seating V-port regulating valve designed to give a straight line characteristic. It offers the advantages of low installation cost, removable valve parts and independence of valve location.

(2) The Single-Element air-operated feed water control system is recommended for installations on which smooth regulation of feed water flow is desired, and a wide regulating range cannot be used. This system is controlled by water level alone as measured by a Bailey Boiler Drum Water Level Recorder.

(3) Bailey Three-Element feed water control is recommended for high capacity low water storage boilers operating at high pressures or for boilers operating at medium pressures with violent load fluctuations. This system is based on actual measurement of water flow to the boiler, steam flow from the boiler and water level within the boiler, and is adjusted primarily to control the rate of water flow to the boiler so that it equals the rate of steam flow from the boiler.

For detailed information consult Sweet's Engineering Catalogs or request bulletin ● No. 183.

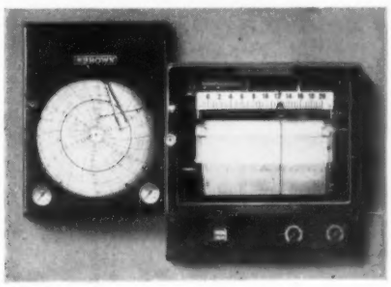
BAILEY METER COMPANY
1041 IVANHOE ROAD · CLEVELAND, O.
Bailey Meter Company Ltd., Montreal, Canada

FOXBORO
Reg. U. S. Pat. Off.

Automatic Controllers

Foxboro makes a comprehensive line of Air- and Electric-Operated Controllers for temperature, pressure, flow, liquid level and humidity. The control systems include every type from the simple Open-and-Shut Control to the Foxboro Stabilog Control System providing the ideal type of control for every job.

For information concerning the entire line of Foxboro Instruments and Controllers refer to "Sweet's Catalog," or write for a copy of Bulletin No. 199-2. **The Foxboro Company, 46 Neponset Ave., Foxboro, Mass., U. S. A.** Branch offices in 25 principal cities.



BROWN CONTROLLERS

Electric or Air-Operated Types

Brown instruments are supplied as electric or air-operated controllers, complete with valves, motor mechanisms and relays, for automatically controlling temperatures, pressures, flows, liquid levels, humidity, etc. Instruments indicate or record while they control power plant or industrial processes. Write for Catalog 89-10.

Brown Pneumatic Remote Transmission System

For remote transmission of measurement and control of temperatures, pressures, flows and liquid levels in hazardous atmospheres. Write for Bulletin 9400.

THE BROWN INSTRUMENT COMPANY, *a division of Minneapolis-Honeywell Regulator Co.*, 4482 Wayne Avenue, Philadelphia, Pa.

BROWN INSTRUMENTS
AND
MINNEAPOLIS-HONEYWELL CONTROL SYSTEMS
To Measure and Control is to Economize

For addresses, see pages 66-76

BAILEY METER
Combustion
CONTROL

● Bailey Meter Automatic Combustion Control of boilers results in substantial saving in fuel; increased boiler capacity; reduction of boiler and furnace maintenance; more time for operators to devote to general station maintenance; and improvement in the general character of service.

Bailey Meter Control makes possible the everyday operation of boilers at test efficiencies because it is a complete combustion control system which (1) automatically maintains steam pressure by supplying fuel and air simultaneously to boilers in accordance with changes in steam demand, (2) automatically maintains most economical fuel-air ratio by incorporating the Bailey Boiler Meter as an integral part of the system, (3) automatically maintains the desired furnace draft, and (4) automatically distributes load among boilers so that each unit carries its share.

This sturdy inexpensive air-operated control system has been applied to all sizes and types of boilers ranging from 200 h.p. upward. It is applicable to all fuels and all methods of firing.

For further information consult Sweet's Engineering Catalogs or write for bulletin No. 102-A.

BAILEY METER COMPANY
1041 IVANHOE ROAD · CLEVELAND, O.
Bailey Meter Company Ltd., Montreal, Canada

Taylor

Self-Acting Temperature Controllers

Write for complete information and catalogs.

Taylor Instrument Companies
ROCHESTER, N.Y. TORONTO, CANADA

Taylor

Liquid Level Indicators, Recorders, Controllers

Write for complete information and catalogs.

Taylor Instrument Companies
ROCHESTER, N.Y. TORONTO, CANADA

CONTROLLERS, AUTOMATIC, Furnace (Continued)
Barber-Coleman Co.
Bristol Co.
Brooke Eng. Co.
Brown Inst. Co.
Cash Co.
Cook Electric Co.
Defender Automatic Reg.
Denver Fire Clay Co.
Detroit Lubricator Co.
Dickson Co.
Friez & Sons
Fulton Sylphon Co.
General Regulator Corp.
Gleason-Avery, Inc.
Hagan Corp.
Hays Corp.
Industrial Engr. Corp.
Johnston Mfg. Co.
Leeds & Northrup
Lindberg Eng. Co.
Marsh Corp.
Mason-Neilan Regulator
McCorkle Co.
Minneapolis-Honeywell
National Airoil Burner
National Brass Co.
Natural Gas Equipment
Paragon Electric Co.
Partlow Corp.
Payne Furnace & Supply
Penn Electric Switch
Perfex Corp.
Pyrometer Inst. Co.
Republic Flow Meters
Ruggles-Klingemann
Spence Engineering Co.
Spencer Thermostat Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
United Cinephone Corp.
Wheelco Inst. Co.
White Mfg. Co.
White-Rodgers Electric
Wilcus Mfg. Co.

CONTROLLERS, AUTOMATIC, Gas Density
Refinery Supply Co.

CONTROLLERS, AUTOMATIC, Gas Mixing (See Controllers, Automatic, Flow Proportioning)

CONTROLLERS, AUTOMATIC, Granular Material Level
Bin-Dicator Co.

CONTROLLERS, AUTOMATIC, Gravity
Arca Regulators, Inc.
Askania Regulator Co.
Bailey Meter Co.
Binckley, G. S.
Foxboro Co.
Mason-Neilan Regulator
Mine & Smelter Supply
Tagliabue Mfg. Co.
Taylor Inst. Cos.

CONTROLLERS, AUTOMATIC, Humidity
American Moistening Co.
Arca Regulators, Inc.
Atlas Valve Co.
Barber-Coleman Co.
Brabender Corp.
Bristol Co.
Brown Inst. Co.
Consol. Ashcroft-Hancock
Cramer & Co., Inc.
Detroit Lubricator Co.
Dietert Co.
Electronic Prod. Co.
Fenwal, Inc.
Foxboro Co.
Friez & Sons
General Controls Co.
H-B Inst. Co., Inc.
Industrial Inst. Co.
Johnson Service Co.
Leeds & Northrup Co.
Mason-Neilan Regulator
McDonnell & Miller
Minneapolis-Honeywell
Moeller Instrument Co.
Moisture Register Co.
Parks-Cramer Co.
Penn Electric Switch
(Continued)

CONTROLLERS, AUTOMATIC, Humidity (Continued)
Phila. Thermometer Co.
Powers Regulator Co.
Robertshaw Thermostat
Sarco Co., Inc.
Scientific Inst. Co.
Supreme Elec. Prods.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Thwing-Albert Inst. Co.
Trerice Co., H. O.
Vaughn-G. E. Witt Co.
Weksler Thermometer

CONTROLLERS, AUTOMATIC, Humidity and Temperature (See Controllers, Automatic, Humidity and Controllers, Automatic, Temperature)

CONTROLLERS, AUTOMATIC, Lighting
Betts & Betts
Cutler-Hammer, Inc.
Luxtrol Co., Inc.
Paragon Electric Co.
United Cinephone Corp.
Weston Elec. Inst. Corp.
Zenith Electric Co.

CONTROLLERS, AUTOMATIC, Liquid Level
Allen-Bradley Co.
American Meter Co.
Arca Regulators, Inc.
Askania Regulator Co.
Atlas Valve Co.
Autocall Co.
Bailey Meter Co.
Belfield Co.
Binckley, G. S.
Bin-Dicator Co.
Boylston Co.
Bristol Co.
Brown Inst. Co.
Builders Iron Foundry
Cash Co.
Cochrane Corp.
Consol. Ashcroft-Hancock
Cutler-Hammer, Inc.
Davis Reg. Co.
Electronic Prod. Co.
D'Este Co.
Elec. Indicator Co.
Fisher Governor Co.
Foster Engg. Co.
Foxboro Co.
Frick Co.
Furnas Electric Co.
General Controls Co.
General Regulator Corp.
Guardian Elec. Mfg. Co.
Hagan Corp.
Hanlon-Waters, Inc.
International Filter Co.
Johnson Service Co.
Kiely & Mueller
Klipfel Mfg. Co.
Lumenite Elec. Co.
Luxtrol Co., Inc.
Mason-Neilan Regulator
McAlear Mfg. Co.
McDonnell & Miller
Mercoid Corp.
Mercon Regulator Co.
Minneapolis-Honeywell
National Airoil Burner
Natural Gas Equipment
Northern Equip. Co.
Paragon Electric Co.
Pioneer Instrument
Powers Regulators Co.
Precision Therm. & Inst.
Preferred Utilities Mfg.
Process Controls, Inc.
Republic Flow Meters
Schade Valve Mfg. Co.
Simplex Valve & Meter
Spence Engineering Co.
Stets Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Uehling Instrument Co.
Water Levels Controls Co.
(Cont'd)

CONTROLLERS, AUTOMATIC, Liquid Level (Continued)
Watts Regulator Co.
Wheelco Inst. Co.
Wilcus Mfg. Co.

CONTROLLERS, AUTOMATIC, Load (See Regulators)

CONTROLLERS, AUTOMATIC, Moisture (See Controllers, Automatic, Humidity)

CONTROLLERS, AUTOMATIC, Phase (See Regulators)

CONTROLLERS, AUTOMATIC, Power Factor (See Regulators)

CONTROLLERS, AUTOMATIC, Pressure & Vacuum
Acme Regulator Co.
Allen-Bradley Co.
American Meter Co.
Arca Regulators, Inc.
Askania Regulator Co.
Arca Regulators, Inc.
Atlas Valve Co.
Autocall Co.
Automatic Control Co.
Automatic Temp. Control
Bailey Meter Co.
Baldwin-Southwark Corp.
Bastian-Blessing Co.
Belfield Co.
Boekel & Co.
Boylston Co.
Bristol Co.
Brooke Eng. Co.
Brown Inst. Co.
Builders Iron Foundry
Cash Co.
Connelly Iron Sponge Co.
Consol. Ashcroft-Hancock
Cutler-Hammer, Inc.
Davis Reg. Co.
D'Este Co.
Detroit Lubricator Co.
Dockson Co.
Eclipse Fuel Engg.
Emerson Apparatus Co.
Fisher Governor Co.
Ford Reg. Valve Co.
Foster Engg. Co.
Foxboro Co.
Fredericks, George
Friez & Sons
Fulton Sylphon Co.
Furnas Electric Co.
Gas. Appl. Specialties
General Controls Co.
General Electric Co.
General Regulator Corp.
Gen. Sales & Prod.
Hagan Corp.
Hanlon-Waters, Inc.
Hays Corp.
Hoke, Inc.
Hydraulic Press Co.
Illinois Engg. Co.
Industrial Inst. Co.
Klipfel Mfg. Co.
Lammert & Mann Co.
Leeds & Northrup Co.
Leslie Co.
Marsh Corp.
Mason-Neilan Regulator
McAlear Mfg. Co.
McDonnell & Miller
Mercoid Corp.
Mercon Regulator Co.
Minneapolis-Honeywell
Natural Gas Equip. Inc.
Northern Equip. Co.
Penn Electric Switch
Perfex Corp.
Powers Regulator Co.
Precision Therm. & Inst.
Ranco Inc.
Republic Flow Meters
Reynolds Gas Regulator
Robertshaw Thermostat
(Cont'd)

"Radio Principle" Temperature Controllers

Wheelco offers a complete line of Temperature Controllers, employing the famous "Radio Principle" Control System. "Radio Principle" Controllers include:

CAPACITROLS
Pyrometer Controllers

POTENTIOTROLS
Potentiometer Controllers

THERM-OTROLS—Indicating or Recording Thermometer Controllers

LIMITROLS—Automatic Shut-off Controllers

PROGRAM CONTROLS—PROPORTIONING CONTROLLERS, RESISTANCE THERMOMETER CONTROLLERS

Complete data are available on all the above Controllers. Write for your copies, today.

Wheelco Instruments Co.
1929-33 S. HALSTED STREET · · · CHICAGO, ILLINOIS

STANDARD & SPECIAL
CONTROLS

To Increase and Improve Production

CONTROLS IN STOCK FOR OUR DEFENSE FORCES

Manufacturers of . . . .

Air and hydraulically, PILOT operated, CONTROLS of WIDE RANGE

FOR

PRESSURE	TEMPERATURE	SPEED
VACUUM	HUMIDITY	LEVEL
FLOW	CONSISTENCY	COMBUSTION

SPECIAL APPLICATIONS

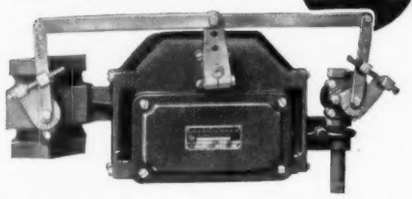
Sensitivity to Within 1%, Fully Compensated

ARCA REGULATORS, INC.
ESTABLISHED 1927 UPPER MONTCLAIR, N. J.

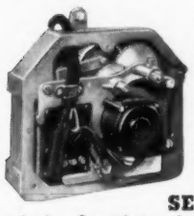
MOTOR-OPERATED CONTROLLERS

... by atc

For automatic control of
Temperature, Level, Pressure, Flow



ATC manufactures the broadest line of valve-control mechanisms, standard types ranging from the simplest "off-on" control to fully balancing of the medium against the demand at any moment. Thousands now in use are demonstrating their accuracy, ruggedness and dependability. All models are easily installed from instructions accompanying shipments. Illustrated is the ATC RELATROL which provides compensating valve positions in direct relation to deviation from the control setting. To show sturdiness and simplicity two views are shown; the upper a front view with two valves, the lower a back view with heavy protective cover removed. Ask about ATC before specifying any valve-control devices.



SEND for BULLETIN G-10
which describes the various standard units
Representatives in Principal Cities

AUTOMATIC TEMPERATURE CONTROL CO.
25 E. Logan St. Philadelphia, Pa.

CONTROLLERS, AUTOMATIC, Pressure and Vacuum (Cont'd)
Ruggles-Klingemann
Schade Valve Mfg. Co.
Schwien Eng. Co.
Scientific Inst. Co.
Spence Engineering Co.
Spencer Thermostat Co.
Sterling Eng. Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Trerice Co., H. O.
Uehling Instrument Co.
Vapor Recovery Systems
Vaughn-G. E. Witt Co.
Victor Equipment Co.
Ward Leonard Elec. Co.
Water Level Controls Co.
Watts Regulator Co.
Wheelco Inst. Co.
White-Rodgers Electric
Wilgus Mfg. Co.

CONTROLLERS, AUTOMATIC, Pyrometric
Am. Gas Furnace Co.
Askania Regulator Co.
Automatic Temp. Control
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Burling Inst. Co.
Dickson Co.
Electronic Lab.
Electronic Prod. Co.
Engelhard, Chas.
Ferner Co.
Foxboro Co.
General Elec. Co.
G-M Labs
Hoskins Mfg. Co.
Ill. Testing Labs.
Industrial Instrument Co.
Leeds & Northrup Co.
Lewis Engg. Co.
Lindberg Eng. Co.
Mason-Neilan Regulator
Partlow Corp.
Pyrometer Instrument Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Thwing-Albert Instrument
Uehling Instrument Co.
Wheelco Inst. Co.

CONTROLLERS, AUTOMATIC, Radio Remote
Am. Automatic Electric
Guardian Elec. Mfg. Co.
RCA Manufacturing Co.
United Cinephone Corp.

CONTROLLERS, AUTOMATIC, Rate-Volume (See Controllers, Automatic, Flow)

CONTROLLERS, AUTOMATIC, Refrigeration
Allen-Bradley Co.
Brown Inst. Co.
Cash Co.
Cutler-Hammer, Inc.
D'Este Co.
Detroit Lubricator Co.
Dickson Co.
Electrimatic Corp.
Frick Co.
Friez & Sons, Julien
Fulton Sylphon Co.
General Controls Co.
Illinois Engr. Co.
Lumenite Elec. Co.
Mason-Neilan Regulator
McAlear Mfg. Co.
Mercoid Corp.
Minneapolis-Honeywell
Penn Electric Switch
Perfex Corp.
Phila. Thermometer Co.
Ranco, Inc.
Sarco Co., Inc.
Schade Valve Mfg. Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
White-Rodgers Electric

CONTROLLERS, AUTOMATIC, RKVA (See Regulators)

CONTROLLERS, AUTOMATIC, Specific Gravity (See Controllers, Automatic, Gravity)

CONTROLLERS, AUTOMATIC, Speed (See Tachometric below)

CONTROLLERS, AUTOMATIC, Stoker (See Controllers, Automatic, Furnace)

CONTROLLERS, AUTOMATIC, Strain-Rate & Stress-Rate
Baldwin-Southwark Corp.

CONTROLLERS, AUTOMATIC, Synchronizing (See Regulators)

CONTROLLERS, AUTOMATIC, Tachometric
Askania Regulator Co.
Bailey Meter Co.
Barbour Stockwell Co.
Brown Inst. Co.
Cutler-Hammer, Inc.
Foxboro Co.
General Regulator Corp.
Hagan Corp.
Mason-Neilan Regulator
Moisture Register Co.
Monitor Controller Co.
Republic Flow Meters

CONTROLLERS, AUTOMATIC, Temperature (See Pyrometric above or Thermometric below)

CONTROLLERS, AUTOMATIC, Temperature-Time (See Controllers, Automatic Thermometric; Controllers, Automatic, Thermostatic; Controllers, Automatic, Time)

CONTROLLERS, AUTOMATIC, Thermometric
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Burling Inst. Co.
Consol. Ashcroft-Hancock
Dickson Co.
Edison Electrical Controls
Electrimatic Corp.
Electro-Medical Lab.
Emerson Apparatus Co.
Fish-Schurman Co.
Foxboro Co.
Friez & Sons
General Elec. Co.
General Regulator Corp.
Gotham Inst. Co.
H-B Inst. Co., Inc.
Ill. Testing Labs.
Kessler Co.
Lindberg Eng. Co.
Marsh Corp.
McAlear Mfg. Co.
Minneapolis-Honeywell
Moeller Instrument Co.
Moisture Register Co.
Paragon Electric Co.
Parks-Cramer Co.
Partlow Corp.
Precision Therm. & Inst.
Scientific Inst. Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Trerice Co.
Weksler Thermometer
Wheelco Inst. Co.

CONTROLLERS, AUTOMATIC, Thermostatic
Accuracy Scientific Inst.
Allen-Bradley Co.
American Inst. Co.
Askania Regulator Co.
Atlas Valve Co.
Bailey Meter Co.
Barber-Coleman Co.
Boekel & Co.
Bristol Co.
Boiler Room Equip.
Brown Inst. Co.
Burling Inst. Co.
Bushnell & Nevins
Cook Electric Co.
Cramer & Co., Inc.
(Cont'd)

TYPE 4357T controller with Type 4300 Wizard Pilot mounted integral with top-work. Note greater compactness of pilot assembly.

FOR ACCURATE PRESSURE CONTROL

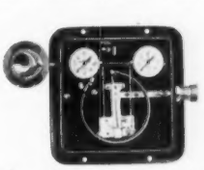
Use

FISHER WIZARD PILOT REGULATORS

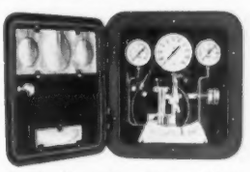
with throttling range adjustment

1. Throttling Range Adjustment —1% to 75% of Tube Range.
2. Vernier hand adjustment mechanism for pressure setting.
3. Larger and more sensitive Bourdon Tube.
4. Weather-proof integral gauge housings.
5. Gas-tight and weather-proof cases.
6. High pressure control connections and leads.
7. Easily changed from reverse to direct acting or vice-versa—without changing tube position.

Wizard Pilot Valves for Remote Control



Surface Mounting Type 4100S Pilot with cover removed.

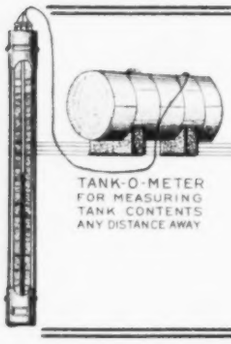


Flush Mounting Type 4100F Pilot with cover open.

DIAPHRAGM MOTOR VALVES
LIQUID LEVEL CONTROLLERS

FISHER GOVERNOR COMPANY
1301 Fisher Bldg., Marshalltown, Iowa

For addresses, see pages 66-76



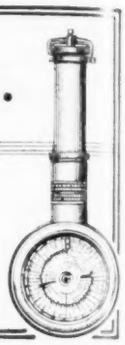
UEHLING INSTRUMENT CO.

Vacuum-Draft-CO_2

Absolute Pressure Recorders - Liquid Level Gauges

473 GETTY AVENUE

PATERSON, N.J.



CONTROLLERS, AUTOMATIC Time (Cont'd)
D'Este Co.
Detroit Lubricator Co.
Dickson Co.
Edison Electrical Control-Ermstat Co.
Fenwal, Inc.
Fish-Schurman Co.
Friez & Sons
Foster Eng. Co.
Fulton Sylphon Co.
General Controls Co.
General Elec. Co.
Gleason-Avery Inc.
Gotham Inst. Co.
H-B Inst. Co.
H. & H. Thermostats
Illinois Engr. Co.
Industrial Engr. Corp.
Johnson Service Co.
Kiely & Mueller
Klipfel Mfg. Co.
Leslie Co.
Marsh Corp.
McCorkle Co.
Mercoid Corp.
Minneapolis-Honeywell
Moisture Register Co.
Partlow Corp.
Penn Electric Switch
Perfex Corp.
Phila. Thermometer Co.
Powers Regulator Co.
Precision Therm. & Inst.
Ranco Inc.
Rascher & Betzold
Robertshaw Thermostat
Ruggles-Klingemann
Sarco Co., Inc.
Spence Engineering Co.
Spencer Thermostat Co.
Sterling Eng. Co.
Struthers-Dunn
Tagliabue Mfg. Co.
Trane Co.
Vaughn-G. E. Witt Co.
Weston Elec. Inst. Corp.
White Mfg. Co.
White-Rodgers Elec. Co.

CONTROLLERS, AUTOMATIC, Time
Allen-Bradley Co.
Am. Gas Accumulator
Automatic Elec. Mfg. Co.
Automatic Temp. Control
Bailey Meter Co.
Betts & Betts
Bristol Co.
Consol. Ashcroft-Hancock
Cramer & Co., Inc.
Eagle Signal Corp.
Edison Electrical Prods.
Elec. Switch Corp.
Foxboro Co.
Friez & Sons, Julien
General Elec. Co.
Gotham Inst. Co.
Hanlon-Waters, Inc.
Industrial Timer Corp.
Industrial Instrument Co.
Johnson Service Co.
(Cont'd)

CONTROLLERS, AUTOMATIC Thermostatic (Continued)
Luxtrol Co., Inc.
Magnetic Gauge Co.
Mason-Neilan Regulator
Minneapolis-Honeywell
Monitor Controller Co.
Paragon Electric Co.
Penn Electric Switch
Powers Regulator Co.
Stromberg Electric Co.
Struthers-Dunn
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Thomas Clock Co., Seth
United Cinephone Corp.
Warren Telechron Co.
Zenith Electric Co.

CONTROLLERS, AUTOMATIC, Vacuum (See Controllers, Automatic, Pressure)

CONTROLLERS, AUTOMATIC, Valve (See Valve-Operating Devices)

CONTROLLERS, AUTOMATIC, Viscosity
Brabender Corp.
Bailey Meter Co.
General Elec. Co.
Green, Arthur B.
Scientific Inst. Co.
United Cinephone Corp.

CONTROLLERS, AUTOMATIC, Voltage (See Regulators)

CONTROLLERS, AUTOMATIC, Volume (See Controllers, Automatic, Flow)

CONTROLLERS, MANUAL (Non-automatic), Field
Cutler-Hammer, Inc.
General Elec. Co.
Monitor Controller Co.
National Elec. Controller
Schaefer Bros. Co.
Ward Leonard Elec. Co.
Westinghouse Elec. & Mfg.

CONTROLLERS, MANUAL (Non-automatic) Motor
Allen-Bradley Co.
Cutler-Hammer, Inc.
Elec. Controller & Mfg.
Furnas Electric Co.
General Elec. Co.
Monitor Controller Co.
National Elec. Controller
Schaefer Bros. Co.
Superior Electric Co.
Ward Leonard Elec. Co.
Westinghouse Elec. & Mfg.

CONTROLLERS, MANUAL (Non-automatic) Rheostatic
Allen-Bradley Co.
Allis-Chalmers Mfg. Co.
(Cont'd)

CONTROLLERS, MANUAL (Non-Automatic) Rheostatic (cont'd)
Beck Bros.
Cutler-Hammer, Inc.
Elec. Controller & Mfg.
General Elec. Co.
Monitor Controller Co.
National Elec. Controller
Ohmite Mfg. Co.
Rubicon Co.
Schaefer Bros. Co.
Ward Leonard Elec. Co.
Westinghouse Elec. & Mfg.

CONTROL SYSTEMS (See Controllers, Automatic)

COUNTERS, Alarm
Durant Mfg. Co.

COUNTERS, Colony
Fisher Scientific Co.
Sargent & Co.
Spencer Lens Co.
Thomas Co., Arthur H.

COUNTERS, Cycle
Bristol Co.
General Elec. Co.
Industrial Inst. Co.
Moisture Register Co.
Paragon Electric Co.
Raytheon Mfg. Co.
Southwestern Electronics
Standard Elec. Time Co.
States Co.
United Cinephone Corp.
Ward Leonard Elec. Co.
Westinghouse Elec. & Mfg.

COUNTERS, Footage
Adde & Co.
Bristol Co.
Durant Mfg. Co.
Elec. Tachometer Corp.
McDonnell Odometer Co.

COUNTERS, Footage (Cont'd)
Ohmer Register Co.
Saxl Inst. Co.
Southwestern Electronics
Talley-Meter Co.
United Cinephone Corp.
Veeder-Root, Inc.

COUNTERS, Geiger-Muller
Cambridge Instrument Co.
Geophysical Instrument
Vacutron, Inc.
Welch Scientific Co.

COUNTERS, Hour
Cramer & Co., Inc.
Elec. Tachometer Corp.
General Elec. Co.
Ohmer Register Co.
Paragon Electric Co.
Southwestern Electronics
United Cinephone Corp.
Warren Telechron Co.
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.

COUNTERS, Lumber
Adde & Co.
Durant Mfg. Co.
Keuffel & Esser Co.
McDonnell Odometer Co.
Moisture Register Co.
Tally-Meter Co.

COUNTERS, Photoelectric
Ess Instrument Co.
Lumenite Electric Co.
Paver-Sills Co.
Photobell Corp.
Production Instrument
Vacutron, Inc.
United Cinephone Corp.
Weston Electrical Inst.

COUNTERS, Production
Adde & Co.
Bristol Co.
Cramer & Co., Inc.
Durant Mfg. Co.
Elec. Tachometer Corp.
Guardian Elec. Mfg. Co.
Hart Mfg. Co., R. E.
Luxtrol Co., Inc.
McDonnell Odometer Co.
Moisture Register Co.
Ohmer Register Co.
Photobell Corp.
Production Inst. Co.
Richardson Scale Co.
Struthers-Dunn
United Cinephone Corp.
Veeder-Root, Inc.

COUNTERS, Revolution
Adde & Co.
Bristol Co.
Boulin Instrument Corp.
Cummings Machine Wks.
Durant Mfg. Co.
Elec. Tachometer Corp.
Gurley, W. & L. E.
Hart Mfg. Co., R. E.
Ideal Commutator Dresser
(Cont'd)

COUNTERS, Revolution (Continued)
Jaeger Watch Co.
Jones-Motrola Sales Co.
Knopf, Paul
Luxtrol Co., Inc.
Marsh Corp., Jas. P.
Mason-Neilan Regulator
McDonnell Odometer Co.
McNab of Bridgeport
Moisture Register Co.
Ohmer Register Co.
Production Inst. Co.
George Scherr Co., Inc.
Southwestern Electronics
Speidel & Co.
Standard Elec. Time Co.
Star Brass Mfg. Co.
Starrett Co., L. S.
Veeder-Root, Inc.
Warren-Knight Co.
Zernickow Co., O.

COUNTERS, Stroke
Adde & Co.
Bristol Co.
Durant Mfg. Co.
Eagle Signal Corp.
Guardian Elec. Mfg. Co.
Hart Mfg. Co., R. E.
International Register Co.
Luxtrol Co., Inc.
McDonnell Odometer Co.
Moisture Register Co.
Photobell Corp.
Ohmer Register Co.
Production Inst. Co.
Southwestern Electronics
United Cinephone Corp.
Veeder-Root, Inc.

COUNTERS, Twist
Luxtrol Co., Inc.
McDonnell Odometer Co.
Roller-Smith Co.
Saxl Instrument Co.
Scott Co., Henry L.
Southwestern Electronics
Suter, Alfred
Veeder-Root, Inc.

COURSE PROTRACTORS (See Protractors, Course)

CRYSTALS, Piezoelectric
Bausch & Lomb Opt.
Bliley Electric Co.
Brush Development Co.
General Radio Co.
Premier Crystal Labs.
RCA Manufacturing Co.
Valpey Crystals
Zeiss, Inc., Carl

CRYSTALS, Quartz
Bliley Electric Co.
Fuess, Inc.
General Radio Co.
Master Optical Co.
Premier Crystal Labs.
RCA Manufacturing Co.
Valpey Crystals

CRYSTALS, Rochelle Salt
Brush Development Co.

CRYSTALS, Tourmaline
Fuess, Inc.
Premier Crystal Labs.
Zeiss, Inc., Carl

CUBIC FOOT BOTTLES (See Bottles, Cubic Feet)

CURRENT LIMITERS
Betts & Betts
General Elec. Co.
Monitor Controller Co.

CURRENT METERS (See Meters, Current)

CURRENT REGULATORS (See Regulators, Current)

CURVE TRACERS (See Drawing Instruments)

CUTMETERS
Amthor Testing Inst. Co.
Coats Mach. Tool Co.
McDonnell Odometer Co.
Veeder-Root, Inc.

CYCLE CONTROLLERS (See Controllers, Automatic, Cycle)

CYCLE COUNTERS (See Counters, Cycle)

CYCLOMETERS
Veeder-Root, Inc.

CYLINDERS, GRADUATED (See Apparatus Laboratory, Glass)

DECELEROMETERS (See Accelerometers)

DECIBEL METERS (See Sound Level Meters)

DEEP SEA INSTRUMENTS
Ballauf Mfg. Co.
Moeller Inst. Co.

DEFLECTION TESTERS, Light Wave (See Testers, Deflection, Light Wave)

DEFORMETERS
Baldwin-Southwark Corp.
Dietert Co.

DELINEASCOPES
Bausch & Lomb
Central Scientific Co.
Leitz, Inc.
Spencer Lens Co.

DEMAND, Indicators (See Meters, Demand, Electric; Meters, Demand, Gas)

DEMAND, Recorders (See Meters, Demand)

DEMAND — LIMITING METERS (See Meters, Demand Limiting)

DEMAND METERS (See Meters, Demand)

DEMAND TOTALIZING RELAYS & DEVICES (See Relays, Demand Totalizing)

Taylor

Flow Indicators, Recorders, Controllers, etc.

Write for complete information and catalogs.

Taylor Instrument Companies

ROCHESTER, N.Y. TORONTO, CANADA

Wheelco Flame-otrols Combustion Safeguards

Wheelco Flame-otrols provide positive safety against combustion explosions resulting from flame failure. Flame-otrols also prevent entry of fuel into the combustion chamber until adequate means are provided for establishing ignition. The Flame-otrol is the only combustion safeguard approved by both Underwriters' Laboratories and Associated Factory Mutual Laboratories for all types of fuel.

Complete description given in Bulletin No. L2-2. Write for your copy, today.

Wheelco Instruments Co.

1929-33 S. HALSTED STREET · · · CHICAGO, ILLINOIS

Taylor

Type "p" Expansion Stem Temperature Controllers

Write for complete information and catalogs.

Taylor Instrument Companies

ROCHESTER, N.Y. TORONTO, CANADA

For addresses, see pages 66-76

DENSIMETERS
Nail, Aluminate Corp.
Pfaltz & Bauer, Inc.
Tagliabue Mfg. Co.

DENSITOMETERS
Applied Research Labs.
Baird Associates
Bausch & Lomb Opt.

DENSOMETERS
Akatos, Inc.
Gaertner Scientific Corp.
Gurley, W. & L. E.
Zeiss, Inc., Carl

DEPTH, Indicators, Length
Chicago Dial Ind. Co.
Federal Prod. Corp.
Gen. Engg. & Model Wks.
Starrett Co.

DEPTH, Indicators, Liquid (See Gages, Liquid Level, Indicating)

DEPTH INDICATORS, Sea
Moeller Inst. Co.

DEPTH, Recorders, Liquid (See Gages, Liquid Level, Indicating)

DETECTOR CARS, For Testing Rails in Track
Sperry Products, Inc.

DETECTORS, Benzol Mine Safety Appliances

DETECTORS, Carbon Monoxide Mine Safety Appliances

DETECTORS, Hydrogen Cyanide Mine Safety Appliances

DETECTORS, Hydrogen Sulphide Mine Safety Appliances

DETECTORS, Mercury Vapor Mine Safety Appliances

DETECTORS, Metal
Associated Research
General Elec. Co.
Geophysical Inst. Co.
Ill. Testing Labs.
Luxtrol Co., Inc.
McFarlin Co.
RCA Manufacturing Co.
United Cinephone Corp.

DETECTORS, Methane Mine Safety Appliances

DETECTORS, Mine Gases
Bushnell & Nevins
Mine Safety Appliances

DETECTORS, Potential
Littelfuse Labs.
Minerallac Electric Co.

DETECTORS, Radium
American Inst. Co.

DETECTORS, Voltage
General Elec. Co.
Gen. Physical Laboratory
Ideal Commutator Dresser
Meter Devices Co.
Minerallac Electric Co.

DIAL INDICATORS (Length)
Ames Co., B. C.
Brown & Sharpe
Chicago Dial Ind. Co.
Federal Prod. Corp.
Gen. Engg. & Model Wks.
Premier Crystal Labs.
Scherr Co., Geo.
Scientific Inst. Co.
Starrett Co.

DIAL MICROMETERS (See Micrometers, Dial)

DIFFERENTIAL PRESSURE (See Controllers, Gages, etc., Pressure)

DIFFRACTION GRATING (See Grating, Diffraction)

DILATOMETERS
American Inst. Co.
Dietert Co.
Ferner Co.
Gaertner Scientific Corp.
E. Leitz, Inc.
Rockwell Co., Stanley P.
Zeiss, Inc., Carl

DIVIDERS, Voltage (Radio Frequency)
Andrew, Victor J.
Beck Bros.
Ferris Inst. Corp.
General Elec. Co.
General Radio Co.
Instrument Resistors, Inc.
International Resistance Measurements Corp.
Muter Company
Ohmite Mfg. Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
Televiso Co.
Ward Leonard Elec. Co.

DIVIDING HEAD, OPTICAL
Zeiss, Inc., Carl

DIVIDING MACHINES
American Askania Corp.
Brown & Sharpe
Gaertner Scientific Corp.
Hayes Scientific Apps.
Mico Instrument Co.
Precise Instrument Co.

DRAFT Indicators (See Gages, Draft) Recorders (See Gages, Draft)

DRAFT Controllers (See Controllers, Automatic, Draft)

DRAWING INSTRUMENTS
Alpha Instrument Co.
Altender & Sons
Dietzen Co.
Drafto Co.
Gurley, W. & L. E.
Henschel & Co.
Kern Co.
Keuffel & Esser Co.
Millers Falls Co.
Nelson Section Liner
Post Co., Frederick
Soltmann, Inc., E. G.
Speidel & Co.
Starrett Co., L. S.
Union Tool Co.
United States Blue Print
Warren-Knight Co.
Weber Co., F.
White Co., Inc., David

DRIFT INDICATORS
Driftmeters, Inc.
Gurley, W. & L. E.
Kollmorgen Optical Co.
Kollsman Inst. Co.
Pioneer Instrument Co.

DRIFT INDICATORS, Bore Hole
Sperry-Sun Well Surveying

DUROMETERS (See Testers & Testing Machines, Hardness)

DUST ANALYSIS APPARATUS
Bausch & Lomb Optical
Central Scientific Co.
Corning Glass Works
Eimer & Amend
Falstrom Co.
Federal Pneumatic Systems
Fisher Scientific Co.
Macalaster Bicknell Co.
Mine Safety Appliances
Pfaltz & Bauer, Inc.
Sargent & Co.
Scientific Glass Apparatus
Scientific Inst. Co.
Willson Products, Inc.
Zeiss, Inc., Carl

DYNAMOMETERS, Hydraulic
Taylor Mfg. Corp.

DYNAMOMETERS, Pull Rod
Hathaway Inst. Co.
Hayes Scientific Apps.
Martin Decker Corp.
Seederer-Kohlbusch, Inc.

DYNAMOMETERS, Rotary Absorption
Bristol Co.
General Elec. Co.
L. A. B. Corp.
Mid-West Dynamometer

DYNAMOMETERS, Tension
Baldwin-Southwark Corp.
Boulin Instrument Corp.
Dillon & Co.
Hathaway Inst. Co.
Olsen Testing Machine
Riehle Div.
Seederer-Kohlbusch
Thwing-Albert

DYNAMOMETERS, Transmission
Seederer-Kohlbusch

EARTH CURRENT METERS (See Meters, Earth Current)

EARTH RESISTANCE METERS
American Inst. Co.
Biddle Co., Jas. G.
Geophysical Inst. Co.
Industrial Insts. Inc.
Rawson Electrical Inst.
Rubicon Co.
Sticht & Co.

EBULLIOMETERS
American Inst. Co.
Braun Corp.
Central Scientific Co.
Eimer & Amend
Precision Therm. & Inst.
Rascher & Betzold
Tagliabue Mfg. Co.

EBULLISCOPE (See Ebulliometers)

ECHELON GRATING (See Grating, Echelon)

ELECTRIC WAVE FILTER SECTIONS
Andrew, Victor J.
Bliley Electric Co.
Clough-Brengle Co.
General Radio Co.
United Transformer Corp.

ELECTROMETERS, Quadrant
Cambridge Inst. Co.
Central Scientific Co.
Pfaltz & Bauer, Inc.
Rubicon Co.
Testrite Instrument Co.
Welch Mfg. Co.

ELECTROMETERS, String
Cambridge Inst. Co.
Geophysical Inst. Co.
Pfaltz & Bauer, Inc.

ELECTRONIC METERS (See Meters, Electronic)

ELECTROPLATING SOLUTION TESTING APPARATUS
Central Scientific Co.
Fisher Scientific Co.
Hellige, Inc.
Industrial Insts. Inc.
Pfaltz & Bauer, Inc.
Sargent & Co.
Taylor & Co., Inc., W. A.
Thwing-Albert Inst. Co.

ELECTROSCOPES
Chicago Apparatus Co.
Denver Fire Clay Co.
Geophysical Inst. Co.
Pfaltz & Bauer, Inc.

ELLIPSOGRAPHS (See Drawing Instruments)

END MEASURES
Pratt & Whitney

ENGINE INDICATORS (See Indicators, Engine)

ENGINE INDICATOR REDUCING MOTION (See Reducing Motion, Engine Indicator)

EUDIOMETERS
Ace Glass Inc.
Central Scientific Co.
Eimer & Amend
Machlett & Son

EUSCOPES
Bausch & Lomb Optical

EXPANSION TEST APPARATUS (See Testers, Expansion)

EXTENSOMETERS
American Inst. Co.
Baldwin-Southwark Corp.
Brabender Corp.
Cambridge Inst. Co.
Ferner Co.
Gen. Engg. & Model Wks.
Hayes Scientific Apps.
Metzger & Son
Olsen Testing Machine

EYEGLASSES, POLARIZED (for Photoelastic Work or Strain Observation, etc.)
Polarizing Inst. Co.
Zeiss, Inc., Carl

FADE-OMETER
Atlas Elec. Devices Co.
Gen. Elec. Vapor Lamp

FAULT LOCATORS
Industrial Insts. Inc.
Leeds & Northrup
Rawson Elec. Inst. Co.
Rubicon Co.
Shallcross Mfg. Co.
Tobe Deutschmann Corp.

FEED WATER METERS
Bailey Meter Co.
Brown Inst. Co.
Builders Iron Foundry
Central Station Steam
Cochrane Corp.
Elec. Indicator Co.
Fischer & Porter
Foxboro Co.
Henszey & Co.
Mason-Neilan Regulator
Morey & Jones, Ltd.
Republic Flow Meters
Simplex Valve & Meter
Tagliabue Mfg. Co.

FEED WATER TESTING APPARATUS
Allis-Chalmers Mfg. Co.
Burrell Technical Supply
Central Scientific Co.
Cochrane Corp.
Electronic Products Co.
G. M. Mfg. Co., Inc.
Hellige, Inc.
Industrial Insts. Inc.
LaMotte Chemical Prod.
Leeds & Northrup Co.
Pfaltz & Bauer, Inc.
Taylor & Co., Inc., W. A.

FIELD RHEOSTATS (See Rheostats, Field)

FIELD-STRENGTH MEASURING SETS
Andrew, Victor J.
Ferris Inst. Corp.
McFarlin Co.
Measurements Corp.
RCA Manufacturing Co.
Tobe Deutschmann Corp.

FILLING MACHINES, Automatic
Anderson Bros. Mfg. Co.
Bowser & Co.
Gump Co., B. F.
Richardson Scale Co.
Syntron Company
Triangle Package Mach.

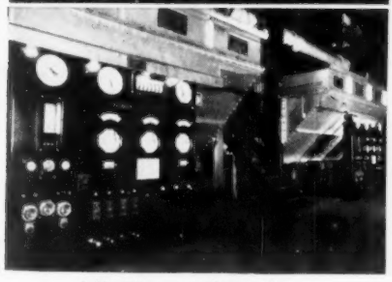
FILLING MACHINES, Bag
Gump Co., B. F.
Richardson Scale Co.
Syntron Company
Triangle Package Mach.

FILLING MACHINES, Barrel
Bowser & Co.

FILLING MACHINES, Can
Anderson Bros. Mfg.
Bowser & Co.
Gump Co., B. F.
Triangle Package Mach.

FILLING MACHINES, Carton
Gump Co., B. F.
Triangle Package Mach.

COMBUSTION CONTROL



All Sizes of Boilers
All Types of Firing

Republic-Smoot combustion control systems are designed for all sizes of boilers and all types of fuel firing equipment.

CONSTANT STEAM PRESSURE
Automatically maintains a constant steam pressure by controlling the fuel and air input to the boilers in balance with the boiler load.

EFFICIENT COMBUSTION
Automatically maintains maximum combustion efficiency over entire range of boiler rating, by controlling simultaneously the fuel and air input to boiler in measured proportions and in a fixed ratio.

LOAD DISTRIBUTION
Automatically distributes load equally among all the boilers, or the load can be distributed between the boilers as desired.

WRITE FOR DATA BOOK No. S-21

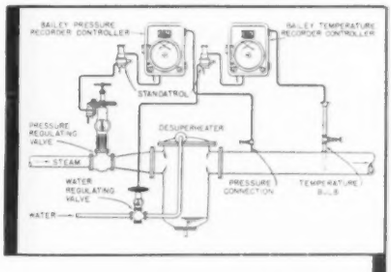
REPUBLIC FLOW METERS CO.
2249 DIVERSEY PKWY., CHICAGO, ILLINOIS

S-M-O-O-T-H VOLTAGE CONTROL for A.C. circuits

The Type "TH" Transtat is the new continuously variable auto-transformer regulator . . . the ideal voltage control for a.c. circuits. It offers high efficiency, good regulation, great flexibility and dependable construction at moderate cost. Standard types are available for controlling voltage to single-phase and polyphase loads rated 10 Kva. and smaller, 50 or 60 cycles, 115, 230 or 460 volts. May we send you bulletin 51-1 which contains complete data?

TRANSTAT
VOLTAGE REGULATORS

AMERICAN TRANSFORMER CO.
178 Emmet St. Newark, N. J.



DESUPERHEATING & PRESSURE REDUCING CONTROL

● Bailey Meter Control of desuperheating and pressure reducing incorporates standard Bailey Recorder-Controllers for both pressure and temperature, as well as a special Bailey Reducing Valve equipped with valve positioner and air cooled packing gland.

The control system is air-operated and is arranged to maintain the desired final steam temperature by controlling the quantity of water fed to a cartridge type desuperheater. This temperature is measured by a sensitive bare bulb temperature recorder-controller with the temperature bulb located at the ● outlet of the desuperheater.

BAILEY METER COMPANY
1041 IVANHOE ROAD . CLEVELAND, O.
Bailey Meter Company Ltd., Montreal, Canada

For addresses, see pages 66-76

FILTERS, Light (See also Filters, Optical)
American Inst. Co.
Bausch & Lomb Opt.
Central Scientific Co.
Corning Glass Works
Fish-Schurman Co.
Fuess, Inc.
Kollmorgen Optical Co.
Leitz, Inc.
Perkin-Elmer Corp.
Zeiss, Inc., Carl

FILTERS, Optical
Akatos, Inc.
Bausch & Lomb Optical
Electronic Laboratory
Fecker, J. W.
General Scientific Corp.
Goerz Amer. Optical Co.
Klett Mfg. Co.
Mico Instrument Co.
Pfaltz & Bauer, Inc.
Testrite Instrument Co.
Triumph Mfg. Co.
United Cinephone Corp.
Woermann-Schuchhardt

FINDERS, VALVE BOX
Geophysical Inst. Co.

FIRE CONTROL INSTRUMENTS, MILITARY & NAVAL
Elec. Indicator Co.
Fecker, J. W.
Kern Co.
Kollmorgen Optical Co.
United Cinephone Corp.

FIRING DISKS
Veritas Firing System

FLASH POINT TESTERS (See Testers, Flash Point)

FLASHERS, Neon Tube
Automatic Elec. Mfg. Co.
Bacharach Industrial Inst.
Betts & Betts
Paragon Electric Co.
Sangamo Electric Co.

FLATNESS TESTERS (See Testers, Flatness, Light Wave)

FLATS, OPTICAL
Am. Telescope Labs.
Baird Associates
Bausch & Lomb Optical
Clark & Sons
Ednal Co.
Fecker, J. W.
Perner Co.
Fish-Schurman Co.
Fuess, Inc.
Gaertner Scientific Corp.
Goerz Amer. Optical Co.
Kollmorgen Optical Co.
(Cont'd)

FLATS, OPTICAL (Continued)
Master Optical Co.
Mico Instrument Co.
Miller Corp., William
Perkin-Elmer Corp.
Scherr Co., Inc., George
Simpson Optical
Spencer Lens
Tinsley Laboratories
Unertl, John
Van Keuren Co.
Wilder, R. S.
Woermann-Schuchhardt
Zeiss, Inc., Carl

FLATS, OPTICAL, Fused Quartz
Bausch & Lomb Opt.
Thermal Syndicate Ltd.

"FLOW"

(Flowmeters measure primarily RATE of flow. For positive or "quantity" fluid meters, see the numerous classes under "Meters")

FLOWMETERS, AIR (See Flowmeters, Gas)

FLOWMETERS, AREA
Cone & Disk Type
Cochrane Corp.
Commercial Engg. Labs.
Fischer & Porter
Friez & Sons
National Meter Co.

FLOWMETERS, AREA
Cylinder & Piston Type
American Inst. Co.
Bowser & Co.
Brown Inst. Co.
Fischer & Porter
National Meter Co.
New Jersey Meter Co.

FLOWMETERS, AREA
Free Float Type
Am. Gas Furnace Co.
D'Este Co.
Fischer & Porter
Fish-Schurman Corp.
Hoke, Inc.
Schutte & Koerting Co.

FLOWMETERS, AREA
Orifice & Plug Type
American Meter Co.
Bacharach Industrial Inst.
Binckley, George Sidney
Brown Inst. Co.
Cochrane Corp.
Fischer & Porter
Mason-Neilan Regulator
Republic Flow Meters
Taylor Inst. Cos.

FLOWMETERS, BLAST (See Flowmeters, Gas)

FLOWMETERS, GAS
Ace Glass, Inc.
American Gas Furnace
American Inst. Co.
American Meter Co.
Bacharach Industrial Inst.
Bailey Meter Co.
Binckley, G. S.
Bowser & Co.
Bristol Co.
Brown Inst. Co.
Builders Iron Fdry.
Clark Blast Meter
Cochrane Corp.
Commercial Engg. Labs.
D'Este Co.
Detroit Air Meter Co.
Eclipse Aviation
Elec. Indicator Corp.
Fischer & Porter
Fish-Schurman Co.
Foxboro Co.
Friez & Sons
Gas Appliance Specialties
Hengsley Co.
Hoke, Inc.
Ill. Testing Labs.
International Filter Co.
Jensen Inst. Co.
Kollsman Inst. Co.
Lambert Meter Co.
Leeds & Northrup
Leupold, Volpel & Co.
Mason-Neilan Regulator
Meriam Co.
Morey & Jones, Ltd.
National Meter Co.
New Jersey Meter Co.
Republic Flow Meters
Ring Balance Co.
Schutte & Koerting Co.
Scientific Glass Apparatus
Selas Company
Simplex Valve & Meter
Spray Engg. Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Victor Equipment Co.

FLOWMETERS, LIQUID (See Flowmeters, Gas)

FLOWMETERS, Open-Stream
Bristol Co.
Builders Iron Fdry.
Cochrane Corp.
Leupold, Volpel & Co.
Mason-Neilan Regulator
Morey & Jones, Ltd.
Republic Flow Meters
Scientific Inst. Co. Calif.
Simplex Valve & Meter

FLOWMETERS, ORIFICE, and NOZZLE
Ace Glass Inc.
American Meter Co.
Askania Regulator Co.
Bacharach Industrial Inst.
Bailey Meter Co.
Binckley, G. S.
Bristol Co.
Brown Inst. Co.
Builders Iron Foundry
Cochrane Corp.
Commercial Engg. Labs.
Eimer & Amend
Fischer & Porter
Foxboro Co.
Hoke, Inc.
Jensen Inst. Co.
Lambert Meter Co., Inc.
Leeds & Northrup Co.
Leupold, Volpel & Co.
Mason-Neilan Regulator
Meriam Co.
Morey & Jones, Ltd.
Permutit Co.
Pgh. Equitable Meter
Republic Flow Meters
Ring Balance Co.
Ruska & Co., Inc.
Scientific Glass Apparatus
Scientific Inst. Co.
Simplex Valve & Meter
Tagliabue Mfg. Co.
Taylor Inst. Cos.

FLOWMETERS, Pitot Tube
Am. Blower Corp.
American Meter Co.
Askania Regulator Co.
Bacharach Industrial Inst.
Bailey Meter Co.
Binckley, G. S.
Bristol Co.
Brown Inst. Co.
Builders Iron Foundry
Cambridge Inst. Co.
Central Scientific Co.
Cochrane Corp.
Defender Automatic Reg.
Detroit Air Meter Co.
Foxboro Co.
Friez & Sons
Fuess, Inc.
Kollsman Inst. Co.
Meriam Co.
Morey & Jones, Ltd.
Pitometer Log Corp.
Precision Therm. & Inst.
Refinery Supply Co.
Republic Flow Meters
Ring Balance Co.
Simplex Valve & Meter
Taylor Inst. Cos.

FLOWMETERS, Steam
Am. Dist. Steam Co.
American Meter Co.
Bailey Meter Co.
Binckley, G. S.
Bristol Co.
Brown Inst. Co.
Builders Iron Fdry.
Cochrane Corp.
Foxboro Co.
Jensen Inst. Co.
Leeds & Northrup Co.
Mason-Neilan Regulator
Meriam Co.
Morey & Jones, Ltd.
Republic Flow Meters
Ring Balance Co.
Simplex Valve & Meter
Tagliabue Mfg. Co.
Taylor Inst. Cos.

FLOWMETERS, Vane
Autocall Co.
Detroit Air Meter Co.
Friez & Sons
Ill. Testing Labs.
Mason-Neilan Regulator
Simplex Valve & Meter

FLOWMETERS, Venturi
Bailey Meter Co.
Binckley, G. S.
Bristol Co.
Brown Inst. Co.
Builders Iron Foundry
Cochrane Corp.
Foxboro Co.
International Filter Co.
Jensen Inst. Co.
Leupold, Volpel & Co.
Mason-Neilan Regulator
Morey & Jones, Ltd.
Republic Flow Meters
Ring Balance Co.
Simplex Valve & Meter
Taylor Inst. Cos.

FLOWMETERS, Weir
Bailey Meter Co.
Binckley, G. S.
Bristol Co.
Brown Inst. Co.
Builders Iron Fdry.
Cochrane Corp.
Elec. Indicator Corp.
Foxboro Co.
Gurley, W. & L. E.
Leupold, Volpel & Co.
Mason-Neilan Regulator
Morey & Jones, Ltd.
Simplex Valve & Meter
Taylor Inst. Cos.

FLUE GAS ANALYZERS (See Gas Analyzers, Flue Gas)

FLUID METERS, GAS (See Gas Meters)

FLUID METERS, LIQUID (See Meters, Liquid)

FLUID METERS, QUANTITY (See Gas Meters; Meters, Current; Meters, Liquid)

FLUORESCENT CHEMICALS
Central Scientific Co.
Pfaltz & Bauer, Inc.
Patterson Screen Co.

FLUORESCENT MERCURY VAPOR TUBES EMITTING WHITE LIGHT (See Light Sources)

FLUOROSCOPES
General Electric X-Ray
Patterson Screen Co.
Westinghouse X-Ray Co.

FLUXMETERS
Annis Co.
Cambridge Inst. Co.
Central Scientific Co.
General Elec. Co.
Leeds & Northrup Co.
Rawson Electrical Inst.
Rubicon Co.
Sensitive Research Inst.

FOLDING ENDURANCE TESTERS (PAPER) (See Testers, Folding Endurance)

FOOT BLOCKS
Ford Motor Co.

FOOT CANDLE METERS
Central Scientific Co.
De Jur-Amsco Corp.
General Elec. Co.
G-M Labs.
Luxtrol Co., Inc.
Pfaltz & Bauer, Inc.
Photovolt Corp.
United Cinephone Corp.
Weston Elec. Inst. Corp.

FOREWARN DETECTOR, for locating hidden weapons (See Detectors, Metal)

FORKS, Synchronization
Elec. Tachometer Corp.
Gaertner Scientific Corp.
Riverbank Laboratories

FORKS, Tuning
Clay-Adams Co.

FORKS, Tuning, Electrically Driven
American Inst. Co.
Cambridge Inst. Co.
Central Scientific Co.
Chicago Apparatus Co.
Elec. Tachometer Corp.
Engineering Labs., Inc.
Gaertner Scientific Corp.
General Radio Co.
Hathaway Inst. Co.
Riverbank Laboratories
Welch Mfg. Co.

FORKS, Vacuum Driven
Cambridge Inst. Co.
Gaertner Scientific Corp.
Riverbank Laboratories

FRACTIONAL HORSEPOWER MOTORS (See Motors, Fractional Horsepower)

FREENESS TESTERS (See Testers, Freeness)

FREQUENCY METERS, Controlling
General Elec. Co.
Leeds & Northrup Co.

FREQUENCY Meters, Electronic
De Jur-Amsco Corp.
General Radio Co.
RCA Manufacturing Co.

FREQUENCY METERS, Indicating
General Elec. Co.
General Radio Co.
Hickok Elec. Inst. Co.
Leeds & Northrup Co.
RCA Manufacturing Co.
Roller-Smith Co.
Sensitive Research Inst.
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.

FREQUENCY METERS, Recording
Bristol Co.
Esterline-Angus Co.
General Elec. Co.
Leeds & Northrup Co.
Roller-Smith Co.
Warren Telechron Co.
Westinghouse Elec. & Mfg.

FREQUENCY METERS, Standards
Bliley Electric Co.
Ferris Inst. Corp.
Millen Mfg. Co.
RCA Manufacturing Co.

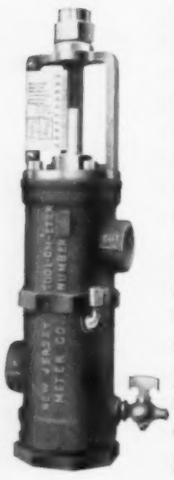
FREQUENCY METERS, Vibrating Reed
Biddle Co., Jas. G.

FRITTED GLASS FILTERS & APPARATUS
Central Scientific Co.
Fish-Schurman Co.
Pfaltz & Bauer, Inc.

FUEL ANALYSIS APPARATUS
Central Scientific Co.
Eimer & Amend
Machlett & Son
Parr Instrument Co.
Precision Scientific Co.
Sargent & Co.
Tagliabue Mfg. Co.

New Jersey Air Meters

TOOL-OM-ETER and DRILL-OM-ETER



Measure the flow of Compressed Air to any process or tool. Guide the maintenance of pneumatic equipment in effective working condition.

These meters are of the constant head, variable orifice type, simple, reliable, portable, only one moving part. Used on air and other gases at 1-300 lb.

New Jersey Meter Co.
PLAINFIELD, N. J.

FLOW METERS
For Steam, Gas and Liquids

LOW PRESSURE METERS
Standard Differential Head Range
1" to 8" Water

HIGH PRESSURE METERS
Standard Differential Head Range
20" to 150" of Water

•

RING BALANCE INSTRUMENT CO.
740 N. Franklin St., Chicago, Ill.

JENSEN FLOW GAGE
WITH
Unique Rolling Scale

Is the only Manometer type flow gage with these seven special features:

Patented rolling scale—Direct readings in any unit of flow—Automatic zero check with each reading—Optional piping connections—Instant registrations of counterflows—No corrodable calibrated chambers—Reliable U-tube performance.

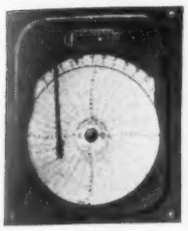
This gage is sturdily built; yet handsome. Standard differential range is 144 inches water using mercury. Standard static range is 300 lbs.

NOTICE

The direct-reading rolling scale for manometers is fully patented. Other manufacturers will please respect our rights

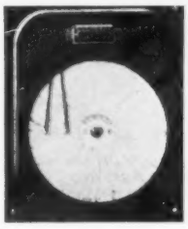
Jensen Instrument Co.
Since 1923
335 CENTRAL AVE. LOS ANGELES
420 MARKET ST. SAN FRANCISCO

For addresses, see pages 66-76



Electric Flow Meter

Mechanical Flow Meter



Pressure & Temp. Recorder

COCHRANE FLOW METERS

The Cochrane Meter line is the most complete flow meter line available to American industry. To satisfy all the different problems encountered in the measurement and recording of fluid flow, Cochrane has designed instruments of specific characteristics to meet these problems. Bulletins are available on any and all of these.

Liquid Level Meter

Ring Balance Meter

Linameter

COCHRANE CORP., 3120 N. 17th St., Philadelphia, Pa.

COCHRANE

ANNOUNCING

New F & P STABL-VIS* Rotameter for flow rate measurement unaffected by changing fluid viscosity!

*Trade Mark Reg.

Fischer & Porter Company now offers the STABL-VIS* rotameter designed to eliminate the effect of changing fluid viscosity from flow rate measurement. Based on the sound application of the latest developments in fluid mechanics research, the F & P STABL-VIS rotameter renders negligible the effect of viscosity changes from as low as 0.1 centipoises to as high as 50.0 centipoises on rotameter calibrations.

This F & P development makes complete the superiority of the rotameter sight flow meter over manometer type flow meters. Visibility, accuracy, simplicity of installation, linear scale and corrosion resistance have already established a preference for F & P rotameters with precision-bore tubes. Now, the development of the STABL-VIS rotameter again raises the standards of flow rate measuring practice.

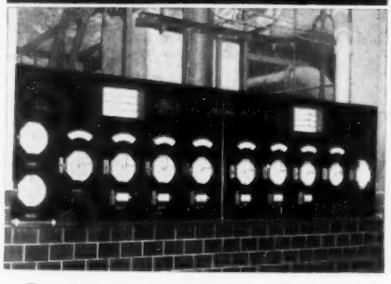
F&P ROTAMETERS

WRITE FOR COMPLETE INFORMATION

FISCHER & PORTER CO.

63 W. QUEEN LANE, PHILADELPHIA, PA.

FLOW METERS



For Measuring the Flow of Steam-Water-Gas-Air-Oil

WORKING PRESSURES

Republic meters are available for all working pressures up to 5000 lb. per sq. in.

RANGE EASILY CHANGED

The range of a Republic meter can be easily and quickly changed by merely changing the range tube.

READING INSTRUMENTS

The Republic indicator, recorder and integrator operate independently of each other and can be supplied separately or in combination. They are remote reading.

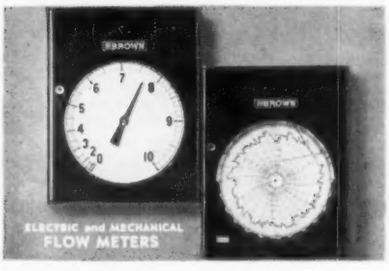
EASILY READ

The indicator scale and the recorder chart all have uniform graduations and are direct reading. The integrator has a large cyclometer type dial.

WRITE FOR DATA BOOK No. 701

REPUBLIC FLOW METERS CO.

2249 DIVERSEY PKWY., CHICAGO, ILLINOIS



For Controlling, Recording, Totalizing and Indicating the Flow of Fluids such as Steam, Water, Gas, Oil, etc.

Brown Flow Meters are available in two types, the Electric type and Mechanical type.

ELECTRIC TYPE: Complete equipment consists of three units, the orifice plate, manometer and instrument. Instrument can be located at a remote point from the orifice and manometer (point of flow measurement).

Because of this flexibility, it is particularly adaptable for applications where instruments are to be remotely located. Write for Catalog 2007.

MECHANICAL TYPE: Complete equipment consists of two units, the orifice plate and the instrument. The meter body is integral with the instrument. Readings are transmitted mechanically from meter body to instrument. Write for Catalog 2203.

THE BROWN INSTRUMENT COMPANY, *a division of Minneapolis-Honeywell Regulator Co.*, 4482 Wayne Avenue, Philadelphia, Pa.

BROWN FLOW METERS
AND
MINNEAPOLIS-HONEYWELL CONTROL SYSTEMS

To Measure and Control is to Economize

BAILEY
Fluid Meters

For STEAM · LIQUIDS · GASES

● Bailey Fluid Meters are designed to indicate, record and integrate the flow of steam, liquids, or gases under practically any pressure or temperature condition.

A great variety of indicating, recording and integrating combinations are available for use with four distinct types of flow mechanisms.

This large variety of possible combinations enables the flow meter engineer to specify equipment which is pre-eminently suited to any flow measuring application.

When it is desired to place indicators, recorders and integrators at a considerable distance from the primary element, Bailey Synchro-Meters are available to provide electric transmission.

For detailed information consult Sweet's Engineering Catalogs or request a copy of bulletin No. 301.

BAILEY METER COMPANY
1041 IVANHOE ROAD · CLEVELAND, O.
Bailey Meter Company Ltd., Montreal, Canada

FUEL FLOW INDICATORS
Askania Regulator Co.
Autocall Co.
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Commerical Eng. Labs.
Eclipse Aviation
Fischer & Porter
Foxboro Co.
Mason-Neilan Regulator
National Airoil Burner
Pioneer Instrument
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Victor Equipment Co.

FURNACE CONTROL SYSTEMS (See Controllers, Automatic)

FURNITURE, LABORATORY
Hamilton Mfg. Co.
Kewaunee Mfg. Co.
Kimball Co., W. W.
Laboratory Const. Co.
Laboratory Furniture Co.
Moline Furniture Works
Sheldon & Co.
Sjostrom Co.
Southern Desk Co.
Welch Mfg. Co.

FUSES, INSTRUMENT
Littelfuse Labs.
Meter Devices Co.

GAGE BLOCKS
Ford Motor Co.
Illinois Tool Works
Pratt & Whitney
Scherr Co., George
Standard Gage Co.
Van Keuren Co.

GAGE GLASS ILLUMINATORS
Wright-Austin Co.

GAGE TESTERS, Deadweight
American Inst. Co.
Amthor Testing Inst. Co.
Ashton Valve Co.
Consol. Ashcroft-Hancock
Crosby Steam Gage Co.
Holz, Herman A.
Olsen Testing Machine
Pioneer Instrument
Refinery Supply Co.
Star Brass Mfg. Co.

GAGE TESTERS, Fluid-scale
Crosby Steam Gage Co.

GAGE TESTERS, Liquid-column
Consol. Ashcroft-Hancock
Pioneer Instrument

GAGES (See also object of Measurement and control)

GAGES, Absolute Pressure
Bailey Meter Co.
Binckley, G. S.
Bristol Co.
Brown Inst. Co.
Consol. Ashcroft-Hancock
Emery Co.
Foxboro Co.
Kollsman Inst. Co.
Mason-Neilan Regulator
Moeller Instrument Co.
Pioneer Instrument
Precision Therm. & Inst.
Scientific Inst. Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Uehling Instrument Co.
United States Gauge Co.
Victor Equipment Co.

GAGES, Air
Ashton Valve Co.
Bailey Meter Co.
Bastian-Blessing Co.
Bristol Co.
Consol. Ashcroft-Hancock
Detroit Air Meter Co.
Foxboro Co.
Friez & Sons
Lambert Meter Co., Inc.
Marsh Corp.
Mason-Neilan Regulator
Rochester Mfg. Co.
Star Brass Mfg.
Tagliabue Mfg. Co.
Trerice Co.
Uehling Inst. Co.
U. S. Gage Co.
Victor Equipment Co.

GAGES, Alarm
Ashton Valve Co.
Bailey Meter Co.
Bristol Co.
Consol. Ashcroft-Hancock
Crosby Steam Gage
Foxboro Co.
Marsh Corp.
Mason-Neilan Regulator
Precision Therm. & Inst.
Star Brass Mfg.
Trerice Co.
U. S. Gage Co.

GAGES, Amplifying
Coats Mach. Tool Co.
Comtor Co.
Federal Prod. Corp.
Precision Gage & Tool
Saxl Instr. Co.
United Cinephone Corp.

GAGES, Automatic Sorting
Instrument Specialties Co.

GAGES, Bore
Brown & Sharpe
Comtor Co.
Federal Prod. Corp.
Pratt & Whitney
Scherr Co.
Sheffield Gage

GAGES, Bourdon
Ashton Valve Co.
Bailey Meter Co.
Baldwin-Southwark Corp.
Bastian-Blessing Co.
Belfield Co.
Bristol Co.
Brown Inst. Co.
Consol. Ashcroft Hancock
Crosby Steam Gage
Dickson Co.
Emery Co.
Foxboro Co.
Hays Corp.
Heise Bourdon Tube Co.
Hoke, Inc.
Improved Gauge Mfg.
Marsh Corp.
Mason-Neilan Regulator
Mercoid Corp.
Pioneer Instrument
Republic Flow Meters
Star Brass Mfg. Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Trerice Co.
United States Gauge Co.

GAGES, Caliper (Dial)
Brown & Sharpe
Federal Prod. Corp.
Glogau & Co.
Starrett Co.

GAGES, Center
Lufkin Rule Co.
Millers Falls Co.
Starrett Co.
Union Tool Co.

GAGES, Comparator
Ames Co., B. C.
Coats Mach. Tool Co.
Comtor Co.
Federal Prod. Corp.
Gaertner Scientific Corp.
General Engg. & Model
Instrument Specialties Co.
Jones & Lamson Machine
Pratt & Whitney
Precision Gage & Tool
Saxl Inst. Co.
Scherr Co.
Sheffield Gage
United Cinephone Corp.

GAGES, Compression
Bacharach Indus. Inst.
G. M. Co. Mfg.
Riehle Div.
Saxl Inst. Co.
Toledo Scale Co.
United States Gauge Co.

GAGES, Cylinder
Ames Co., B. C.
Coats Mach. Tool
Comtor Co.
Federal Prod. Corp.
Lufkin Rule Co.
Pratt & Whitney
Starrett Co.
United Cinephone
Victor Equipment

GAGES, Depth, Linear
Ames Co., B. C.
Brown & Sharpe
Glogau & Co.
Instrument Specialties
Lufkin Rule Co.
Park Sales
Pratt & Whitney
Starrett Co.
Union Tool Co.

GAGES, Depth, Navigational
Geophysical Inst. Co.

GAGES, Dial, Machinists'
Ames Co., B. C.
Brown & Sharpe
Chicago Dial Ind.
Federal Prod. Corp.
Ferner Co.
Genales, Andrew
General Engg & Model
Randall, Frank E.
Starrett Co.
Waltham Dial Gage

GAGES, Differential Pressure
American Meter Co.
Bacharach Industrial Inst.
(Cont'd)

GAGES, Differential Pressure (Continued
Bailey Meter Co.
Binckley, G. S.
Boiler Room Equip.
Bristol Co.
Brown Inst. Co.
Consol. Ashcroft Hancock
Crosby Steam Gage
Defender Automatic Reg.
Detroit Air Meter Co.
Dwyer Mfg. Co.
Ellison Draft Gage Co.
Foxboro Co.
Friez & Sons
Fuess, Inc.
Gas Appliance Specialties
Hays Corp.
Jensen Inst. Co.
Lambert Meter Co.
Mason-Neilan Regulator
Meriam Co.
Moeller Instrument
Morey & Jones, Ltd.
Pioneer Instrument
Pitometer Log Corp.
Precision Therm. & Inst.
Preferred Utilities Mfg.
Republic Flow Meters
Scientific Glass Apparatus
Scientific Inst. Co.
Simplex Valve & Meter
Tagliabue Mfg. Co.
Taylor Inst. Co.
Uehling Instrument Co.
U. S. Gage Co.

GAGES, Draft (See Gages, Differential Pressure)

Taylor

VOLUMETRIC PRESSURE GAUGES

Write for complete information and catalogs.

Taylor Instrument Companies

ROCHESTER, N.Y. TORONTO, CANADA

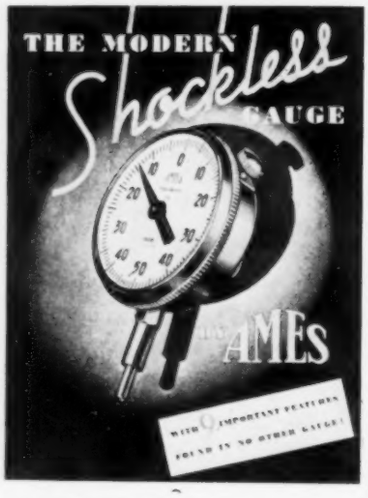
MARSH PRESSURE GAUGES

• Marsh Pressure Gauges are known for accuracy and their ability to stay accurate. Pressure gauges in all standard ranges up to 20,000 pounds—also vacuum, altitude, compound and recording gauges. An outstanding feature is the "Recalibrator" — far superior to the ordinary "zero" adjustment. The latest addition to the Marsh line is the new Marsh "Mastergauge" series—gauges tremendously advanced in accuracy and stamina.

Write for details

JAS. P. MARSH CORPORATION
2047 Southport Ave., Chicago, Ill.

The Marsh line also includes dial thermometers, steam traps, radiator air valves and supply valves, vents, etc. Ask for bulletins.



AMES Shockless Gauges

are steadily replacing less durable ones on measuring jobs where rough treatment is apt to damage the sensitive mechanisms. They accurately indicate the slightest size variations and have several other exclusive features besides the shock-absorber. Send for your copy of the bulletin describing them.

B. C. AMES COMPANY
WALTHAM, MASS.

HIGHEST

HICKOK

ACCURACY

WATTMETERS
FREQUENCY METERS
POWER FACTOR METERS
VOLTMETERS
AMMETERS, ETC.

4" Rectangular Cases, Flush or Surface Mounting. With or without illuminated dials. Neat, attractive, easy to mount.

COMPLETE INFORMATION UPON REQUEST

Manufacturers of all sizes and types of Electrical Indicating Instruments

HICKOK

ELECTRICAL INSTRUMENT COMPANY
10514 DUPONT AVE., CLEVELAND, OHIO

FEDERAL

DIAL INDICATORS
for
TESTING INSTRUMENTS

Improved Low Friction Federal Indicators lend themselves particularly to laboratory and scientific uses, where precision measurements must be exceptionally accurate. They are available in five sizes graduated from .00025" to 0.005".

For catalog including latest developments write to—

FEDERAL PRODUCTS CORP.
1142 Eddy St., Providence, R. I.
Detroit—Chicago—Cleveland—New York

For addresses, see pages 66-76

GAGES, Drill Grinding
Lufkin Rule Co.
Morse Twist Drill
Starrett Co.

GAGES, Feeler
Improved Gauge Mfg.
Lufkin Rule Co.
Millers Falls Co.
Starrett Co.
Union Tool Co.
Van Keuren Co.

GAGES, Gas
Abercrombie Pump Co.
American Meter Co.
Bailey Meter Co.
Bastian-Blessing
Bristol Co.
Connelly Iron Sponge
Detroit Air Meter
Dickson Co.
Foxboro Co.
Gas Appliance Specialties
Lambert Meter Co.
Mason-Neilan Regulator
Rochester Mfg. Co.
Specialty Glass Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Victor Equipment

GAGES, Grinding
Ames Co., B. C.
Brown & Sharpe
Comtor Co.
Federal Prod. Corp.
Lufkin Rule Co.

GAGES, Height
Brown & Sharpe
Ford Motor Co.
General Engg. & Model
Lufkin Rule Co.
Scherr Co.
Starrett Co.

GAGES, Hook
Gurley, W. & L. E.
Scientific Inst. (Calif.)
White Co., Inc.

GAGES, Hydrostatic
(See Gages, Liquid Level, Indicating)

GAGES, Internal Dial
Coats Mach. Tool
Comtor Co.
Federal Prod. Corp.
Gen. Engg. & Model Wks.
Scherr Co.

GAGES, Limit
Ford Motor Co.
General Elec. Co.
Gen. Engg. & Model Wks.
Greenfield Tap & Die
M-G Gage Corp.
Pratt & Whitney
Sheffield Gage
United Cinephone
Van Keuren Co.

GAGES, Liquid Level, Indicating
American Meter Co.
Ashton Valve Co.
Autocall Co.
Bacharach Industrial Inst.
Bailey Meter Co.
Bastian-Blessing
Binckley, G. S.
Bin-Dicator Co.
Boston Auto Gage
Bowser & Co.
Bristol Co.
Brown Inst. Co.
Builders Iron Foundry
Burt Scientific Labs.
Certified Gauge
Cochrane Corp.
Consol. Ashcroft Hancock
Crosby Steam Gage
Davis Reg. Co.
Defender Automatic Reg.
Dickson Co.
Elec. Indicator Corp.
Elec. Tachometer Corp.
Fisher Governor Co.
Foxboro Co.
Frick Co.
General Controls Co.
General Elec. Co.
Gurley, W. & L. E.
Hanlon-Waters, Inc.
International Filter Co.
Jensen Inst. Co.
Jerguson Gage Co.
Johnston & Jennings
Kellogg Switchboard
King-Seeley
Klingerit, Inc.
Leeds & Northrup Co.
Leupold, Volpel
Liquidometer Co.
Lumenite Elec. Co.
Luxtrol Co., Inc.
Marsh Corp.
Mason-Neilan Regulator
McAlear Mfg. Co.
McNeill Engr. Equip.
Meriam Co., The
Morey & Jones, Ltd.
Nathan Mfg. Co.
Natural Gas Equipment
Paragon Electric
Penberthy Injector Co.
Petrometer Corp.
Pioneer Instrument Co.
Pneumercator Co., Inc.
Precision Therm. & Inst.
Preferred Utilities Mfg.
Reliance Gauge Column
Republic Flow Meters
Rochester Mfg. Co.
Schutte & Koerting Co.
(Cont'd)

GAGES, Liquid Level, Indicating (Cont'd)
Simplex Valve & Meter
Star Brass Mfg.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Uehling Instrument Co.
U. S. Gauge Co.
Vapor Recovery Systems
Wallace & Tiernan
Westinghouse Elec. & Mfg.
Wheelco Inst. Co.
Williams Gauge Co.
Wright-Austin Co.
Yarnell-Waring Co.

GAGES, Liquid Level, Recording (See Gages, Liquid Level, Indicating)

GAGES, Loss of Head
Bailey Meter Co.
Binckley, G. S.
Bristol Co.
Builders Iron Foundry
Foxboro Co.
International Filter Co.
Jensen Inst. Co.
Morey & Jones, Ltd.
Taylor Inst. Cos.

GAGES, Mercury
Amthor Testing Mach.
Bacharach Industrial Inst.
Bailey Meter Co.
Builders Iron Foundry
Central Scientific
Connelly Iron Sponge
Consol. Ashcroft Hancock
Defender Automatic Reg.
Dubrovin, John
Dwyer Mfg. Co.
Eimer & Amend
Gas Appliance Specialties
General Physical Lab.
Heise Bourdon Tube Co.
Jensen Inst. Co.
Machlett & Son
Mason-Neilan Regulator
Meriam Co.
Moeller Instrument
Morey & Jones
Precision Therm. & Inst.
Refinery Supply Co.
Scientific Glass Apparatus
Simplex Valve & Meter
Specialty Glass Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Trerice Co.
Uehling Instrument Co.

GAGES, Micrometer
Ames Co., B. C.
Amthor Testing Mach.
Brown & Sharpe
Central Scientific Co.
Coats Mach. Tool Co.
Gaertner Scientific Corp.
Haines Gauge Co.
Instrument Specialties Co.
Lufkin Rule Co.
Millers Falls Co.
Precision Therm. & Inst.
Scherr Co.
Van Keuren Co.
Zeiss, Inc., Carl

GAGES, Oil (See Gages, Liquid Level)

GAGES, Optical
Bausch & Lomb Optical
Chicago Dial Ind. Co.
Clark & Sons
Fecker, J. W.
Gaertner Scientific Corp.
Jarrell-Ash Co.
Jones & Lamson Machine
Scherr Co.
United Cinephone Corp.
Zeiss, Inc., Carl

GAGES, Paint Film
General Elec. Co.
Hathaway Inst. Co.
Instrument Specialties Co.
Munsell Color Co.
Saxl Inst. Co.

GAGES, Paper Thickness (See Gages, Thickness)

GAGES, Piston Ring
Littelfuse Inc.
Wilkening Mfg. Co.

GAGES, Pitch Diameter
Brown & Sharpe
Federal Prod. Corp.
Greenfield Tap & Die
Lufkin Rule Co.
Pratt & Whitney
Scherr Co., Inc.
Union Tool Co.
Van Keuren Co.

GAGES, Plug
West & Dodge Thr. Gage
Brown & Sharpe
Ford Motor Co.
Greenfield Tap & Die
Morse Twist Drill
Pratt & Whitney
Precision Gage & Tool
Sheffield Gage
West & Dodge Thr. Gage

GAGES, Pneumatic Tank
Bacharach Industrial
Mason-Neilan Regulator
Pneumercator Co.
Rochester Mfg. Co.
Uehling Inst. Co.

GAGES, Precision Measuring
Ames Co., B. C.
Brown & Sharpe
Comtor Co.
Federal Prod. Corp.
Ferner Co.
Ford Motor Co.
Gaertner Scientific Corp.
Instrument Specialties Co.
Lufkin Rule Co.
Pratt & Whitney
Rieker Instrument Co.
Scherr Co., Inc.
Sheffield Gage
Starrett Co.
Thwing-Albert Inst. Co.
Van Keuren Co.
Carl Zeiss, Inc.

GAGES, Pressure, Indicating
Abercrombie Pump Co.
American Meter Co.
Ashton Valve Co.
Bacharach Industrial Inst.
Bailey Meter Co.
Baird Associates
Baldwin-Southwark Corp.
Bastian-Blessing
Belfield Co.
Boekel & Co.
(Cont'd)

GAGES, Pressure, Indicating (Continued)
Bristol Co.
Brown Inst. Co.
Brush Development Co.
Central Scientific Co.
Certified Gauge
Clark Blast Meter
Commercial Eng. Labs.
Consol. Ashcroft Hancock
Continental Elec. Co.
Crosby Steam Gage
Defender Automatic Reg.
Dickson Co.
Dubrovin, John
Eimer & Amend
Emery Co.
Esterline-Angus Co.
Fisher Scientific Co.
Foxboro Co.
Fredericks, George
Friez & Sons
Gas Appliance Specialties
General Elec. Co.
General Physical Lab.
Gotham Inst.
Green, Henry J.
Hays Corp.
(Cont'd)

Taylor

PRESSURE AND VACUUM GAUGES
INDICATING, RECORDING, CONTROLLING

Write for complete information and catalogs.

Taylor Instrument Companies
ROCHESTER, N.Y. TORONTO, CANADA

DON'T LET FAULTY DRAFT RUN-UP STEAM COSTS

MAINTAINING PROPER DRAFT is relatively a simple job once a Hays Draft Gage has been installed. Accurate measurements supplant guesswork, resulting in more efficient combustion.

HAYS ORIGINATED and perfected the dry or diaphragm type of draft gage and today Hays Draft Gages are standard equipment in thousands of the nation's boiler rooms.

HAYS DRAFT GAGES are offered in a wide variety of types from the V-type, illustrated above, to recording gage. Send for our catalog today. Write to 925 Eighth Avenue, Michigan City, Indiana.

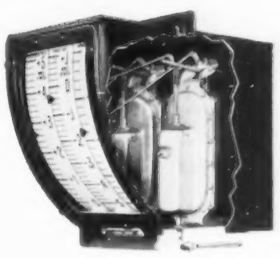
The HAYS CORPORATION
COMBUSTION INSTRUMENTS AND CONTROLS
MICHIGAN CITY, INDIANA, U.S.A.

FOXBORO
Reg. U. S. Pat. Off.

PRESSURE GAUGES

The true value of a pressure gauge lies in the measuring element. Foxboro offers you the ideal type for each class of pressure measurement from a full vacuum to 20,000 lbs. When you specify Foxboro Indicating or Recording Gauges you can be sure of accuracy and capacity to withstand continuous service over long periods of time.

Write for information and specifications on the type of instrument you need . . . and send us details of the service requirements. **The Foxboro Company, 46 Neponset Avenue, Foxboro, Massachusetts, U. S. A.** Branch offices in principal cities of United States and Canada.



BAILEY MULTI-POINTER GAGES

● Bailey Multi-Pointer Gages are made with any number of pointers and any scale combination from one to twelve. The pointers have 10" motion over plainly marked plastic molded scales so that readings can be taken at a distance of 20 feet. Diaphragm actuated elements enable this gage to withstand over-drafts and over-pressures without injury to the unit or its calibration.

All secondary factors such as draft, pressure, temperature, stoker speed and pulverizer feed can be indicated on one Bailey Multi-Pointer Gage.

BAILEY METER COMPANY
1041 IVANHOE ROAD · CLEVELAND, O.
Bailey Meter Company Ltd., Montreal, Canada

For addresses, see pages 66-76

U. S. PRESSURE GAUGES

ARE RUGGED, DEPENDABLE, ACCURATE.

U. S. GAUGE CO.

Makers of Indicating and Recording Pressure Gauges

ALL SIZES AND TYPES FOR EVERY PURPOSE

•

44 BEAVER ST. - NEW YORK

GAGES, Pressure, Indicating (Continued)
Heise Bourdon Tube Co.
Hoke, Inc.
Industrial Instrument Co.
Jerguson Gage Co.
King-Seeley Corp.
Kollsman Inst. Co.
Kurman Electric Co.
Leeds & Northrup
Leupold. Volpel & Co.
Logansport Machine
Marsh Corp.
Mason-Neilan Regulator
Mercoid Corp.
Meriam Co.
Moeller Instrument Co.
Parks Co., Harry S.
Pioneer Instrument
Pittsburgh Equitable Met.
Plumb Co., Inc.
Precision Gage & Tool
Precision Therm. & Inst.
Preferred Utilities Mfg.
RCA Manufacturing Co.
Refinery Supply Co.
Republic Flow Meters
Rochester Mfg. Co.
Scientific Inst. Co.
Star Brass Mfg. Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Trerice Co.
Uehling Instrument Co.
United Cinephone Corp.
U. S. Gauge Co.
Victor Equipment Co.
Wagner & Son, Carl H.
Welch Mfg. Co.
Wilgus Manufacturing

GAGES, Pressure—Recording (See Gages, Pressure, Indicating)

GAGES, Pressure Temperature (See Gages, Pressure Indicating)

GAGES, Pressure, Tire
Air Balance Inst. Co.
U. S. Gauge Co.

GAGES, Pressure & Vacuum (See Gages, Pressure Indicating)

GAGES, Profile
Pratt & Whitney
Precision Gage & Tool
Sheffield Gage
Stockton Profile Gauge
United Cinephone Corp.

GAGES, Radius
Lufkin Rule Co.
Starrett Co.
United Cinephone Corp.

GAGES, Rain (See Rain Gages)

GAGES, Rifle Bore
Hathaway Inst. Co.
Pratt & Whitney

GAGES, Ring
Brown & Sharpe
Greenfield Tap & Die
Morse Twist Drill
Pratt & Whitney
Precision Gage & Tool
Sheffield Gage
West & Dodge Thread
Zeiss, Inc., Carl

GAGES, Screw Thread
Brown & Sharpe
Federal Prod. Corp.
Greenfield Tap & Die
Lufkin Rule Co.

(Cont'd)

GAGES, Screw Thread (Continued)
Millers Falls Co.
Pratt & Whitney
Reed Small Tool Works
Sheffield Gage
Starrett Co.
Union Tool Co.
West & Dodge Thread
Zeiss, Inc., Carl

GAGES, Sliding
Pratt & Whitney
Van Keuren Co.

GAGES, Snap
Brown & Sharpe
Gen. Engg. & Model Wks
Greenfield Tap & Die
M-G Gage Corp.
Pratt & Whitney
Precision Gage & Tool
Sheffield Gage

GAGES, Spline
Brown & Sharpe
Pratt & Whitney
Precision Gage & Tool
Sheffield Gage

GAGES, Star
Pratt & Whitney

GAGES, Strain
American Inst. Co.
Baldwin-Southwark
Binckley, G. S.
General Elec. Co.
Hathaway Inst. Co.
Metzger & Son
Miller Corp., Wm.
Olsen Testing Machine
Pratt & Whitney
Saxl Inst. Co.
Starrett Co.

GAGES, Surface
Ames Co., B. C.
Brown & Sharpe
Genales, Andrew
Federal Prod. Corp.
Lufkin Rule Co.
Millers Falls Co.
Saxl Inst. Co.
Starrett Co.
Zeiss, Inc., Carl

GAGES, Taper
Brown & Sharpe
Federal Prod. Corp.
Precision Gage & Tool
Pratt & Whitney
Sheffield Gage
Starrett Co.

GAGES, Telescoping
Brown & Sharpe
Lufkin Rule Co.
Pacific Specialty Supply
Starrett Co.

GAGES, Thickness
American Askania Corp.
Ames Co., B. C.
Amthor Testing Inst. Co.
Brown & Sharpe
Federal Prod. Corp.
Ford Motor Co.
General Elec. Co.
Gen. Engg. & Model Wks
Hathaway Inst. Co.
Ill. Testing Labs.
Instrument Specialties Co
Lufkin Rule Co.
Magnetic Gauge Co.
Metzger & Son
Millers Falls Co.
Pratt & Whitney
Precision Gage & Tool
Precision Therm. & Inst.
Randall, Frank E.
Saxl Inst. Co.
Sheffield Gage
Speidel & Co.
Starrett Co.
Suter, Alfred
Thwing-Albert Inst. Co.
Union Tool Co.
Van Keuren Co.
Waltham Dial Gage

GAGES, Thickness, Magnetic
American Inst. Co.
Commercial Eng. Labs.
General Elec. Co.
Hathaway Inst. Co.
Hickok Elec. Inst. Co.
Magnetic Gauge Co.

GAGES, Tide
American Inst. Co.
Ballauf Mfg. Co.
Binckley, G. S.
Uehling Instrument Co.

GAGES, Torque
Martin Decker Corp.
Riehle Div.
Saxl Inst. Co.
Toledo Scale Co.

GAGES, Vacuum (See Gages, Pressure)

GAGES, Venturi (See Flow Meters, Venturi)

GAGES, Water Level (See Gages, Liquid Level)

GAGES, Wind
American Inst. Co.
Detroit Air Meter
Friez & Sons
Fuess, Inc.
Green, Henry J.
Kenyon Instrument Co.
Rieker Inst. Co.
Taylor Inst. Cos.

GAGES, Wire Measuring
Ames Co., B. C.
Brown & Sharpe
Federal Prod. Corp.
Greenfield Tap & Die
Hathaway Inst. Co.
Instrument Specialties Co
Pratt & Whitney
Starrett Co.

GALVANOMETERS, A-c.
Brown Inst. Co.
Brush Development Co.
Cambridge Inst. Co.
Central Scientific Co.
General Elec. Co.
Hathaway Inst. Co.
Heiland Research Corp.
Leeds & Northrup Co.
Pfaltz & Bauer, Inc.
Rawson Electrical Inst.
Rubicon Co.
Ruska & Co.
Sensitive Research Inst.
Tagliabue Mfg. Co.
Welch Mfg. Co.
Weston Elec. Inst.
Wheelco Inst. Co.

GALVANOMETERS, Astatic
Cambridge Inst. Co.
Central Scientific Co.
Chicago Apparatus Co.
Hathaway Inst. Co.
Leeds & Northrup Co.
Rawson Electrical Inst.
Sensitive Research Inst.
Tagliabue Mfg. Co.
Wheelco Inst. Co.

GALVANOMETERS, D-c.
Brown Inst. Co.
Cambridge Inst. Co.
Central Scientific Co.
Chicago Apparatus Co.
General Elec. Co.
G-M Labs.
Hathaway Inst. Co.
Hickok Elect. Inst. Co.
J-B-T Instruments
Leeds & Northrup Co.
Pfaltz & Bauer, Inc.
Rawson Electrical Inst.
RCA Manufacturing Co.
Roller-Smith Co.
Rubicon Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
Simpson Elec. Co.
Tagliabue Mfg. Co.
Thwing-Albert Inst.
Triplett Electrical Inst.
W. M. Welch Mfg. Co.
Weston Elec. Inst. Corp.
Wheelco Inst. Co.

GALVANOMETERS, Piezoelectric
Brush Development Co.

GALVANOMETERS, Reflecting
Rawson Electrical Inst.

GALVANOMETERS, Vacuum-tube
Engineering Labs., Inc.
Hathaway Instrument Co.
Measurements Corp.
National Technical Labs.
Tagliabue Mfg. Co., C. J.

GALVANOSCOPES
Central Scientific Co.

GAS ANALYZERS, Air
Burrell Technical Supply
Cambridge Inst. Co.
Central Scientific Co.
Elmer & Amend
Fish-Schurman Co.
Fisher Scientific Co.
Friez & Sons
Hebler Co.
Mercoid Corp.
Mine Safety Appliances
Permutit Co.
Sargent & Co.
Scientific Glass App.
Tagliabue Mfg Co.
Willson Products, Inc.

GAS ANALYZERS, Ammonia
Burrell Technical Supply
Cambridge Inst. Co.
Engelhard, Chas.
Mercoid Corp.
Permutit Co.
Sargent & Co.
Tagliabue Mfg. Co.

GAS ANALYZERS, Carbon Dioxide
Ace Glass Inc.
Bacharach Industrial Inst.
Brown Inst. Co.
Cambridge Inst. Co.
Central Scientific Co.
Defender Automatic Reg.
Dwyer Mfg. Co.
Elmer & Amend
Ellison Draft Gage Co.
Engelhard, Chas.
Fish-Schurman Co.
Fisher Scientific Co.
Friez & Sons
Gow-Mac Instrument
Hays Corp.
Hebler Co.
Lantz-Phelps Corp.
Leeds & Northrup Co.
Machlett & Son
Permutit Co.
Porter Co.
Precision Therm. & Inst.
Preferred Utilities Mfg.
Republic Flow Meters
Sargent & Co.
Scientific Glass App.
Scientific Inst. Co.
Tagliabue Mfg. Co.
Uehling Instrument Co.
Williams Apparatus Co.

GAS ANALYZERS, Carbon Monoxide
Bacharach Industrial Inst.
Burrell Technical Supply
Cambridge Inst. Co.
Chicago Apparatus Co.
Eclipse Aviation
Elmer & Amend
Fish-Schurman Co.
Hays Corp.
Leeds & Northrup Co.
Machlett & Son
Mine Safety Appliances
Sargent & Co.
Scientific Glass App.
Scientific Inst. Co.
Tagliabue Mfg. Co.

GAS ANALYZERS, Chlorinated Hydrocarbons
Willson Products, Inc.

GAS ANALYZERS, Flue Gas (See Gas Analyzers, Carbon Dioxide)

GAS ANALYZERS, Hydrogen
Bacharach Industrial Inst.
Burrell Technical Supply
Chicago Apparatus Co.

GAS ANALYZERS, Hydrogen Sulphide
American Meter
Brown Inst. Co.
Burrell Technical Supply
Bushnell & Nevins
Cambridge Inst. Co.
Connelly Iron Sponge
Elmer & Amend
Johnson-Williams, Ltd.
Mine Safety Appliances
Sargent & Co.
Scientific Glass Apparatus

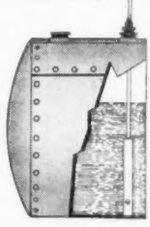
TANK GAUGING EQUIPMENT

PETROMETER

PETROMETER is used for all kinds of liquids, lighter or heavier than water, stored in any type of tank or container made of steel, glass, hard rubber, concrete or other kinds of materials.

PETROMETER is an instrument for indicating at a remote location the vertical depth of liquid in tanks.

PETROMETER will indicate gallonage or weight of liquids. It may also be used as a remote reading Hydrometer.



PETROMETER CORP.
4 Star Square
LONG ISLAND CITY, N. Y.

CAMBRIDGE POT GALVANOMETER ... *rugged* ... *inexpensive*

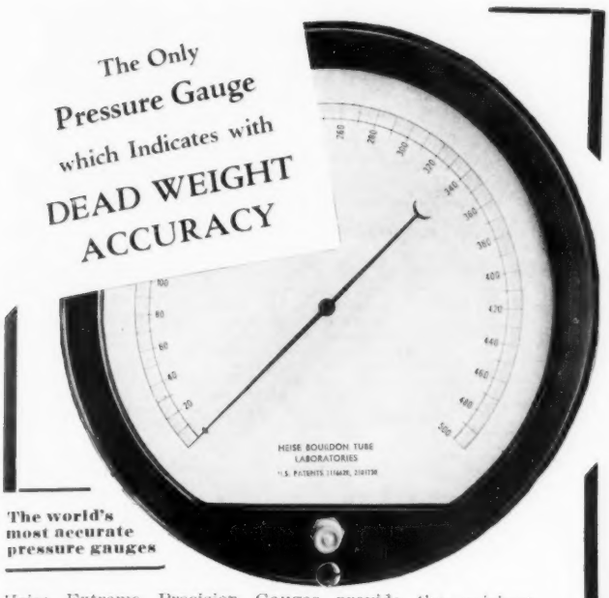
THIS GALVANOMETER is a small, inexpensive instrument with the sensitivity of a reflecting galvanometer and the ruggedness of a milliammeter. It requires no levelling or clamping and is accordingly well adapted for general laboratory use. It is fitted with both a pointer and a reflecting mirror suitable for "null" point indications as well as for use with a lamp and scale. It is only one of many Cambridge Galvanometers.

CAMBRIDGE FURNISHES a wide range of instruments for high and low frequency measurements for use in standardizing, research and commercial testing laboratories. Literature describing a wide range of instruments suitable for precise measurements of both D.C. and A.C. current, voltage and power, will be sent upon request. Instruments will be constructed to meet special requirements.

CAMBRIDGE INSTRUMENT CO., INC. 3732 Grand Central Terminal
Pioneer Manufacturers of Precision Instruments New York, N. Y.

For addresses, see pages 66-76

The Only
Pressure Gauge
which Indicates with
DEAD WEIGHT
ACCURACY



The world's most accurate pressure gauges

Heise Extreme Precision Gauges provide the quickest *reliable* way of testing: (1) for faster results where dead weight testers have been used, (2) inspectors' gauges, (3) new ordinary gauges. Indispensable to manufacturers of equipment which includes gauges. *Important feature:* revolving dial simplifies calculations by eliminating tare figure. Zero setting is instantaneous from front of bezel and self locking.

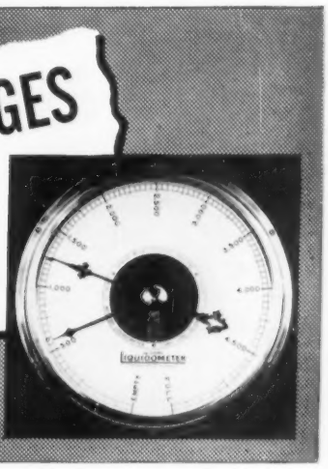
Note. Prices are surprisingly low. Example, $120 for a ten-inch (11¾" O.D.) gauge with 500 graduations.

HEISE Bourdon Tube Laboratories

275 NOBLE AVE. BRIDGEPORT, CONN.

In Collaboration with The A. H. Emery Co.

TANK GAUGES
for
EVERY REQUIREMENT



LIQUIDOMETER remote reading gauges automatically indicate or record liquid levels. No pumps, valves or auxiliary units required to read them. Balanced hydraulic transmission system ingeniously compensates for temperature variations on communicating tubing. Accuracy unaffected by variation in specific gravity. Approved by Underwriters Laboratories and similar bodies for gauging hazardous liquids. Models are available for remote signals, automatic control of pumps, etc. DIRECT READING models available where remote reading is not required.

Write for details on LIQUIDOMETER instruments.

THE LIQUIDOMETER CORP.

36-27 SKILLMAN AVE. LONG ISLAND CITY, N. Y.

GOW-MAC
AIR FUEL RATIO and CO_2 METERS

FOR COMBUSTION EFFICIENCY

in furnace and engine on road or in shop

FOR QUALITY CONTROL

in industry where CO_2 or hydrogen are used

FOR SAFETY

in maintaining inert gases at standards of normal or reducing atmospheres

GOW-MAC
INSTRUMENT COMPANY

22 Lawrence St. Newark, N. J.

GAS ANALYSIS
Solves Many Problems

The Engelhard Thermal Conductivity Method of Gas Analysis has enabled many plants to control operations closely. It has resulted in products consistently uniform at a considerable saving in time and money.

You can analyze—for example:

Hydrogen	**Argon**
Carbon Dioxide	**Nitrous Oxide**
Sulphur Dioxide	**Acetone**
Ammonia	**Helium**

We shall be glad to consider special problems.

SEND FOR LITERATURE

Charles Engelhard, Inc.

90 Chestnut St. Newark, N. J.

Manufacturers of Pyrometers, Resistance Thermometers, Combustion Indicators, Exhaust Gas Analysers, Flue Gas Analysers, Thermocouples.

A LABORATORY JOB DONE IN THE FIELD

HAYS PORTABLE COMBUSTION TEST SETS are equipped to handle an accurate gas analysis—right in the field.

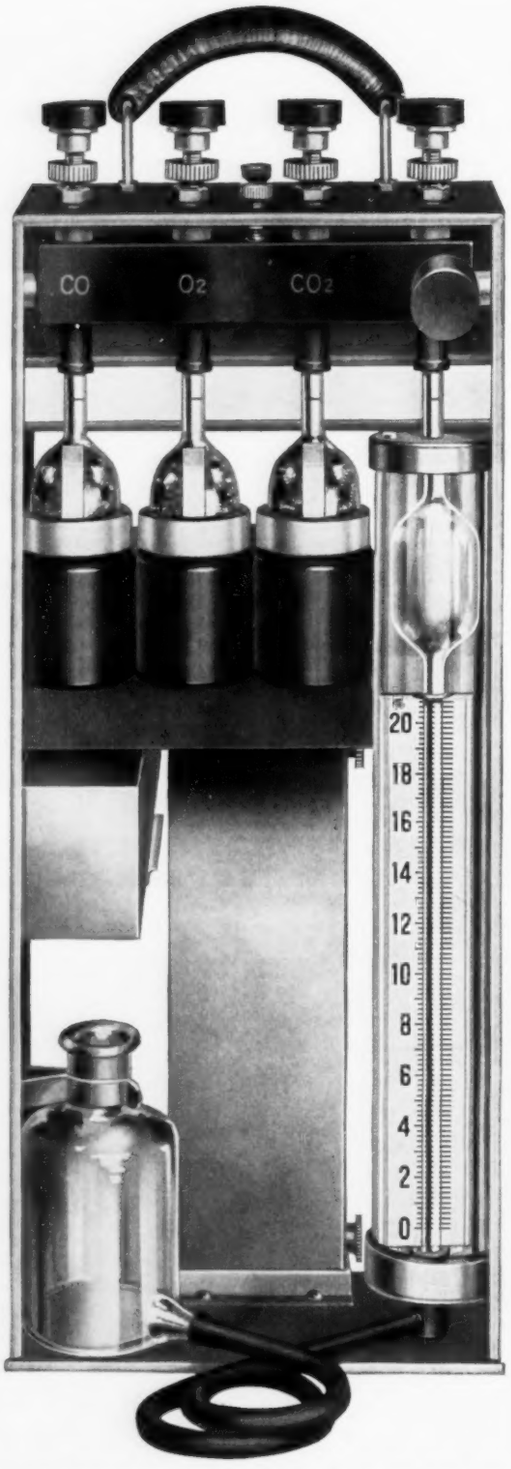
Installations become more successful, troublemakers are rapidly exposed, guesswork becomes a thing of the past.

Test Sets are available with all necessary equipment for the analysis for CO_2, CO, and O_2—complete with flue gas thermometer, and draft gage. For further particulars—write to 925 Eighth Avenue, Michigan City, Indiana.

The HAYS CORPORATION

MICHIGAN CITY INDIANA U.S.A.

ELLISON GAS ANALYZER



A NEW DEPARTURE IN GAS ANALYZER DESIGN

Monel case 4x4½x18", covers removed, with or without draft gage sets and thermometers. Header and seats of hard rubber. Needle valve stems of corrosion-proof alloy, swivel joint. Pipettes filled with curled hard rubber. White panels in pipettes and back of capillaries. White scale, 7 to 8" long, compensated for "dead volume"—no error. Solution containers interchangeable. Gas line ⅛"—high speed sampling. Air seal, U type, trouble-proof. Burette jacket filled with glycerine, Monel cap top and bottom. Automatic or hand zero leveling. Accurate, durable and speedy.

"A Very Superior Instrument"

ELLISON DRAFT GAGE CO. 214 W. Kinzie St. Chicago

GAS ANALYZERS, Nitric Oxide
Cambridge Inst. Co.
Eimer & Amend
Rubicon Co.
Sargent & Co.

GAS ANALYZERS, Orsat
Ace Glass Inc.
Bailey Meter Co.
Burrell Technical Supply
Central Scientific Co.
Chicago Apparatus Co.
Defender Automatic Reg.
Dwyer Mfg. Co.
Eimer & Amend
Ellison Draft Gage
Fish-Schurman Co.
Fisher Scientific Co.
Hays Corp.
Machlett & Son
Precision Therm. & Inst.
Sargent & Co.
Scientific Glass App.
Specialty Glass Co.

GAS ANALYZERS, Oxygen
Burrell Technical Supply
Chicago Apparatus Co.
Cambridge Inst. Co.
Eclipse Aviation
Eimer & Amend
Hays Corp.
Hebler Co.
Mine Safety Appliances
Sargent & Co.
Scientific Glass App.
Tagliabue Mfg. Co.

GAS ANALYZERS, Oxygen & Nitrogen Apparatus
Boekel & Co.
Burrell Technical Supply
Cambridge Inst. Co.
Central Scientific Co.
Eimer & Amend
Hebler Co.
Sargent & Co.
Tagliabue Mfg. Co.

GAS ANALYZERS, Sulphur Dioxide
Bacharach Industrial Inst.
Bushnell & Nevins
Cambridge Inst. Co.
Eimer & Amend
Engelhard, Chas.
Fish-Schurman Co.
Hebler Co.
Leeds & Northrup Co.
Sargent & Co.
Scientific Glass App.
Tagliabue Mfg. Co.
Uehling Instrument Co.

GAS APPARATUS, Orifice Well Tester
Refinery Supply Co.

GAS DENSITY METERS
American Meter Co.
Central Scientific Co.
Ess Inst. Co.
Precision Therm. & Inst.
Refinery Supply Co.
Permutit Co.

GAS FLOW INDICATORS
American Meter Co.
Askania Regulator Co.
Bacharach Industrial Inst.
Bailey Meter Co.
Binckley, G. S.
Bristol Co.
Brown Inst. Co.
Cochrane Corp.
Fischer & Porter
Fish-Schurman Co.
Foxboro Co.
Mason-Neilan Regulator
Pittsburgh Equitable Met.
Precision Scientific Co.
Republic Flow Meters
Selas Company
Simplex Valve & Meter
Tagliabue Mfg. Co.
Taylor Inst. Co.

GAS HOLDER POSITION INDICATORS
Bailey Meter Co.
Elec. Indicator Corp.
Elec. Tachometer Corp.
Foxboro Co.
Zuhr, Inc., Henry

GAS LEAK INDICATORS
Bullard Co.
Gilmore, E. B.
Heiland Research Corp.
Johnson-Williams, Ltd.
McFarlin Co.
Taylor Inst. Cos.
Water Leak Detector Co.
Western Instrument Co.

GAS METERS, INFERENTIAL — Area (See Flowmeters, Area)

GAS METERS, INFERENTIAL—Flow Nozzle (See Flowmeters, Orifice and Nozzle)

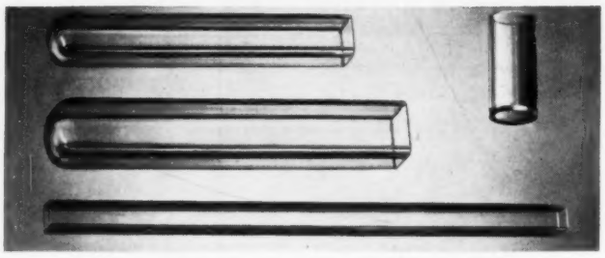
GAS METERS, INFERENTIAL—Orifice (See Flowmeters, Orifice and Nozzle)

GEOPHYSICAL APPARATUS

- Seismic
- Electrical
- Gravity
- Geothermal
- Magnetic
- Radioactive

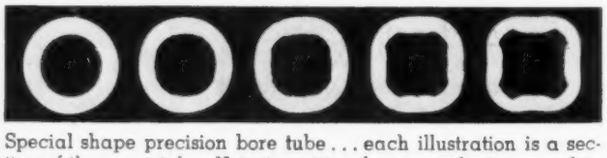
GEOPHYSICAL INSTRUMENT CO.
WASHINGTON, D. C.

PRECISION BORE TUBES
in PYREX and KIMBLE NC GLASS



Any diameter from 0.5 millimeters to 4.0 inches

Accuracy to 0.0002". Round, oval, square, hexagonal and octagonal. Also special shapes; see illustration below:



Special shape precision bore tube . . . each illustration is a section of the same tube. Note transition from round at one end to special fluted shape at other.

F&P ROTAMETERS

Used for viscometers, haemocytometers, optical cells, flowmeters, capillary tubes, rotameters, and other engineering and scientific purposes.

FISCHER & PORTER CO.
63 W. QUEEN LANE, PHILADELPHIA, PA.

For addresses, see pages 66-76

FOR AUTOMATIC . . . CONTINUOUS RECORDS

of

- **OXYGEN** in flue and stack gases and in furnace atmospheres.
- **HYDROGEN** in steam.
- **DISSOLVED OXYGEN** in boiler feed water.
- **CARBON DIOXIDE** in flue gases.
- **CARBON MONOXIDE, NITROGEN, ARGON, Etc.**

INQUIRIES FOR SPECIAL APPLICATIONS INVITED

CAMBRIDGE GAS ANALYZERS

NO CHEMICALS . . . NO INTERMITTENT SAMPLING

CAMBRIDGE GAS ANALYZERS eliminate labor; provide accurate continuous records; need minimum attention.

Send for Literature

CAMBRIDGE INSTRUMENT CO., INC. 3732 Grand Central Terminal
Pioneer Manufacturers of Precision Instruments New York, N. Y.

GAS METERS, INFERENTIAL — Pitot-tube (See Flowmeters, Pitot-tube)
GAS METERS, INFERENTIAL—Venturi (See Flowmeters, Venturi)
GAS METERS, POSITIVE, Bellows, Slide-valve
American Meter Co.
Binckley, George Sydney
Cleveland Gas Meter
Lambert Meter Co.
Littelfuse Inc.
Pittsburgh Equit. Meter
Sprague Meter Co.

GAS METERS, POSITIVE, Rotary
Pittsburgh Equit. Meter
GAS METERS, POSITIVE, Special for extremely small flows
American Meter Co.
Detroit Air Meter Co.
GAS METERS, POSITIVE, Wet-drum
American Meter Co.
Lambert Meter Co.
Precision Scientific Co.
GAS & VAPOR DISCHARGE TUBES, Argon
DuMont Labs., Inc., A.B.

GAS & VAPOR DISCHARGE TUBES, Carbon Dioxide
Barkon-Frink
Central Scientific Co.
Fredericks, George
Friez & Sons
General Physical Lab.
GAS & VAPOR DISCHARGE TUBES, Hyrogen
Baird Associates
GAS & VAPOR DISCHARGE TUBES, Mercury
Barkon-Frink
Central Scientific Co.
Fredericks, George
Gen. Elec. Lamp Dept.
General Physical Lab.
Jarrell-Ash Co.
Machlett & Son
GAS & VAPOR DISCHARGE TUBES, Neon
Barkon-Frink
Central Scientific Co.
Fredericks, George
Gen. Elec. Lamp Dept.
General Physical Lab.
Jarrell-Ash Co.
Machlett & Son
GAS & VAPOR DISCHARGE TUBES, Nitrogen
Central Scientific Co.
Fredericks, George
General Physical Lab.
GAS & VAPOR DISCHARGE TUBES, Sodium
Central Scientific Co.
Fredericks, George
Gen. Elec. Lamp Dept.
Jarrell-Ash Co.

GASOLINE MILEAGE TESTER (For automobiles and trucks) (See Meters, Mileage)
GEAR MEASUREMENT & TEST INDICATORS & RECORDERS
GENERATORS, SIGNAL
Andrew, Victor J.
Bendix Marine Products
Boonton Radio Corp.
Clough-Brengle Co.
Electronic Design Corp.
Ferris Inst. Corp.
General Radio Co.
Jackson Electrical Inst.
Jones-Orme Co.
Measurements Corp.
Pioneer Instrument
Radio City Products Co.
RCA Manufacturing Co.
Televiso Co.
Triplett Electrical Inst.
United Transformer Corp.
Webber Co., Earl
GEOPHONES
Geophysical Instrument Co.
Globe Phone Mfg. Corp.
Hathaway Inst. Co.
Helland Research Corp.
Ruska & Co., Inc.
GEOPHYSICAL INSTRUMENTS
American Inst. Co.
Brush Development Co.
Cambridge Inst. Co.
Engineering Labs., Inc.
Geophysical Inst. Co.
Hathaway Inst. Co.
Helland Research Corp.
Meco Instrument Co.
Miller Corp., Wm.
Ruska & Co., Inc.
Sensitive Research Inst.
Televiso Co.

GEOPHYSICAL INSTRUMENTS, Gravity Meters
Brown Gravity-Meter
GILLMORE NEEDLES (See Needles, Gillmore)
GLARE METERS
Akatos, Inc.
Bausch & Lomb Opt.
Central Scientific Co.
Gaertner Scientific Corp.
Saxl Inst. Co.
GLASS, Low Reflecting Surfaces
National Research Corp.
GLASS STRAIN TESTERS (See Testers & Testing Machines, Glass Strain)
GLASS TUBING, Heat Resisting
Corning Glass Works
Fish-Schurman Co.
Kimble Glass Co.
GLASS TUBING, Ultra-Violet Transmitting
Corning Glass Works
Fish-Schurman Co.
General Elec. Co.
GLASS TUBING, Ultra-Violet Transmitting Opaque to Visible
Corning Glass Works
Fish-Schurman Co.
General Elec. Co.
GLASSWARE, LABORATORY (See Apparatus, Laboratory, Glass)

GLOSS METERS
Akatos, Inc.
Bausch & Lomb Opt.
Central Scientific Co.
Gaertner Scientific Corp.
Pfaltz & Bauer, Inc.
Saxl Inst. Co.
Sensitive Research Inst.
Suter, Alfred
Woermann-Schuchhardt
Zeiss, Inc., Carl
GONIOMETERS
Automatic Temp. Control
Fuess, Inc.
Hayes Scientific App.
Zeiss, Inc., Carl
GOVERNORS (See also object of measurement and control)
GOVERNORS, Air (See Regulators, Automatic, Air)
GOVERNORS, District
American Meter Co.
Connelly Iron Sponge
Pittsburgh Equit. Meter
GOVERNORS, Engine
Cash Co.
Hanlon-Waters, Inc.
Judson Governor Co.
Mason-Neilan Regulator
Pickering Governor
Pittsburgh Equit. Meter
GOVERNORS, Gas (See Regulators, Automatic, Air)
GOVERNORS, Hydraulic
Allis-Chalmers Mfg.
Cash Co.
Hagan Corp.
Hanlon-Waters, Inc.
McAlear Mfg. Co.
Schade Valve Mfg.
Tagliabue Mfg. Co.

JAMES A. MAHONEY

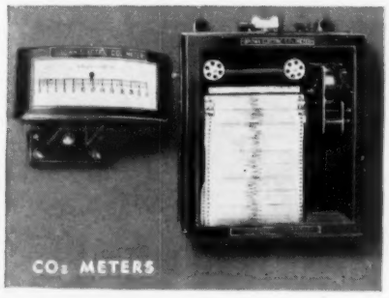
Products of Glass

LABORATORY SCIENTIFIC

INDUSTRIAL

•

140 West 42nd St., New York, N. Y.
Wisconsin 7-1220



For Recording and Indicating the Per Cent CO_2 in Flue Gas

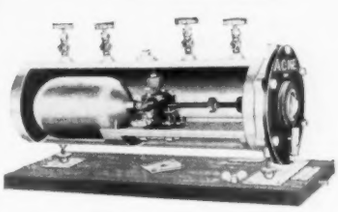
Analyzes the flue gases electrically and then transmits the readings electrically to an indicating or recording meter, or both. No moving parts or chemicals in the gas analysis cell.

Furnished in three types for recording from one to six readings on a single chart, 7" wide. Single point recorders record the per cent CO_2 on a full width chart, using an inked ribbon. Multiple models record from two to three CO_2 readings on a full width chart using a multi-colored ribbon. Multiple duplex models record from two to six readings on two sections of a full-width chart, using two measuring systems and one multi-colored inked ribbon. Flue gas temperature can be recorded on same duplex chart with CO_2 reading. One, two or three temperatures and CO_2 readings can be recorded on the same duplex chart. Indicating reading is obtained directly on a 6" scale.

Write for Catalog 3006. THE BROWN INSTRUMENT COMPANY, *a division of Minneapolis-Honeywell Regulator Co.*, 4482 Wayne Avenue, Philadelphia, Pa.

BROWN ELECTRIC CO_2 METER
AND
MINNEAPOLIS-HONEYWELL CONTROL SYSTEMS
To Measure and Control is to Economize

GAS GRAVITY BALANCE



The Ac-Me Specific Gravity Gas Balance is designed for use in the:

LABORATORY
PLANT OR FIELD

Four Spring Suspension is used, giving accurate results and maximum portability.

Write for description.

Gas Testing Instruments and Laboratory Apparatus Catalog 26A
(Just off Press)

The Refinery Supply Co.

621 E. 4th St. TULSA, OKLA.
1309 Capitol Ave. HOUSTON, TEX.

A 24-HOUR RECORD—giving accurate and dependable measurements so vital to efficient and economical operation.

Hays Combustion Meters employ the Orsat principle for measurement of CO_2. Water operated — no moving parts—extreme accuracy coupled with dependable performance.

There is a Hays Combustion Meter to fit every requirement—remote or integral mounting, indicating or recording or both. Write to 925 Eighth Avenue, Michigan City, Indiana, for free catalog.

The HAYS CORPORATION
MICHIGAN CITY INDIANA, U.S.A.

For addresses, see pages 66-76

Taylor

"Easykleen" & "Permax" Hydrometers

Write for complete information and catalogs.

Taylor Instrument Companies

ROCHESTER, N.Y. TORONTO, CANADA

GOVERNORS, Liquid Level (See Controllers, Automatic, Liquid Level)

GOVERNORS, Pressure (See Regulators, Automatic, Air)

GOVERNORS, Pump (See Regulators, Automatic, Air)

GOVERNORS, Station
Connelly Iron Sponge

GOVERNORS, Steam (Regulators, Automatic, Air)

GOVERNORS, Turbine
Cash Co.
Hagan Corp.
Mason-Neilan Regulator

GRADUATING MACHINES (See Dividing Machines)

GRAIN TESTERS (See Testers, Grain)

GRAPHIC (See object of measurement and control)

GRANULAR MATERIALS MEASUREMENTS, Level Indicator & Control
Bin-Dicator Co.

GRANULAR MATERIALS MEASUREMENTS, Particle Size Separator
Fed. Pneumatic Systems

GRANULAR MATERIALS MEASUREMENTS, Volume-Flow Indicators
Builders Iron Foundry
Dietert Co.
Richardson Scale Co.

GRANULAR MATERIALS MEASUREMENTS, Volume Integrating Meters
Bailey Meter Co.
Builders Iron Foundry
Richardson Scale Co.

GRANULAR MATERIALS MEASUREMENTS, Weight-Flow Indicators & Recorders
Builders Iron Foundry
Richardson Scale Co.

GRANULAR MATERIALS MEASUREMENTS, Weight-Integrating Meters
Builders Iron Foundry
Richardson Scale Co.
Toledo Scale Co.

GRATING, Diffraction
Central Scientific Co.
Dietert Co.
Fish-Schurman Co.
Fuess, Inc.
Gaertner Scientific Corp.
Laboratory Specialties
Welch Mfg. Co.

GRATING, Echelon
Fuess, Inc.
Gaertner Scientific Corp.
Jarrell-Ash Co.

GRAVIMETERS
American Askania Corp.
Brown Gravity-Meter
Geophysical Inst. Co.
Ruska & Co.

GRAVITOMETERS
American Meter Co.
Binckley, G. S.
Brown Gravity-Meter
Eimer & Amend
Refinery Supply Co.

GRAVITY, Indicators & Recorders
American Meter Co.
Bailey Meter Co.
Binckley, G. S.
Eimer & Amend
Foxboro Co.
Mott-Smith Corp.
Specialty Glass Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.

GREASE TESTING APPARATUS
American Inst. Co.
Brabender Corp.
Central Scientific Co.
Eimer & Amend
Fish-Schurman Co.
Fisher Scientific Co.
Humboldt Mfg. Co.
Precision Scientific Co.
Saxl Inst. Co.
Tagliabue Mfg. Co.
Televiso Co.
Western Machinery Co.

GROUND DETECTORS
General Elec. Co.
Pioneer Instrument
Roller-Smith Co.
Ruska & Co.
Westinghouse Elec. & Mfg.

GROUND RESISTANCE METERS
Biddle Co., Jas. G.
Borden Elec. Co.
General Elec. Co.
Geophysical Inst. Co.
Heiland Research Corp.
Industrial Inst. Inc.
Roller-Smith Co.
Rubicon Co.
Shallcross Mfg. Co.
Sticht & Co.

HARDNESS METER, for Plastic Films (See Testers, Hardness of Plastic Films)

HARDNESS TESTER (See Testers & Testing Machines, Hardness)

HARMONIC ANALYZERS
Gaertner Scientific Corp.
General Radio Co.
Keuffel & Esser Co.
Mico Instrument Co.
Scientific Apparatus Co.
United Transformer Corp.

HELIOSTATS
Eastern Science Co.
Fecker, J. W.
Gaertner Scientific Corp.

HIGH-FREQUENCY APPARATUS
Clough-Brengle Co.
Ferris Inst. Corp.
General Electric X-Ray
International Resistance
McFarlin Co.
Measurements Corp.
Raytheon Mfg. Co.
RCA Manufacturing Co.
United Cinephone Corp.

HOOK GAGES (See Gages, Hook)

HORIZONS, ARTIFICIAL (See Artificial Horizons)

HOUR COUNTERS (See Time Meters)

HOUSINGS, Instrument
Eby, Inc.
Electric Tachometer
Falstrom Co.
Karp Metal Products
Lewyt Metal Products

HUMIDITY INSTRUMENTS, Aspiration psychrometric (See Psychrometers, Aspiration)

HUMIDISTATS
American Moistening Co.
Automatic Products Co.
Detroit Lubricator Co.
Friez & Sons
Johnson Service Co.
Minneapolis-Honeywell
Penn Electric Switch
Powers Regulator Co.
Standard Engg. Works
Supreme Elec. Prods.

HUMIDITY INSTRUMENTS, Hygrometric (See Hygrometers)

HUMIDITY INSTRUMENTS, Aspiration Psychrometric (See Psychrometers, Aspiration)

HUMIDITY INSTRUMENTS, Conductivimetric
Industrial Insts. Inc.
Leeds & Northrup Co.

HUMIDITY INSTRUMENTS, Hygrometric (See Hygrometers)

HUMIDITY INSTRUMENTS, Hygroscopic
Bristol Co.
Foxboro Co.
Friez & Sons, Julien
Taylor Inst. Cos.

HUMIDITY INSTRUMENTS, Sling Psychrometric (See Psychrometers, Sling)

HYDROGEN-ION APPARATUS (See Testers, Hydrogen-Ion)

HYDROGEN-ION DETERMINATION INSTRUMENTS
Bristol Co.
Cambridge Inst. Co.
Central Scientific Co.
Coleman Elec. Co.
Colloid Equip. Co.
Fisher Scientific Co.
General Elec. Co.
Hellige, Inc.
LaMotte Chemical Prod.
Leeds & Northrup Co.
Leitz, Inc.
Machlett & Son
Natl. Technical Labs.
Pfaltz & Bauer, Inc.
Rascher & Betzold
Rawson Elec. Inst. Co.
Rubicon Co.
Sargent & Co.
Tagliabue Mfg. Co.
Taylor & Co., Inc., W.A.
Thwing-Albert Inst. Co.
Wallace & Tiernan
Welch Mfg. Co.
Wilkens-Anderson Co.

HYDROGENATION APPARATUS
American Inst. Co.
Central Scientific Co.
Machlett & Son
Parr Instrument Co.

HYDROMETERS, Indicating
Ace Glass Inc.
Accuracy Scientific Inst.
Brooklyn Thermometer Co.
Chasiyn Co.
Central Scientific Co.
Edelmann & Co.
Eimer & Amend
Fisher Scientific Co.
Fleischhauer & Son
Fried & Lustig
G. M. Mfg. Co., Inc.
Griebel Instrument Co.
H-B Inst. Co., Inc.
Huddleston, J. S. F.
Mason-Neilan Regulator
Moeller Instrument Co.
Nurnberg Therm. Co.
Phila. Thermometer Co.
Precision Therm. & Inst.
Rascher & Betzold
Ruehfel Co.
Ruth Glass Division
Schultheis Corp., E. W.
Scientific Glass Apparatus
Scientific Inst. Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Testrite Instrument Co.
Trerice Co.
Wagner & Son, Carl H.
Weksler Thermometer
Western Machinery Co.

HYDROMETERS, Mud
Braun Corp.

HYDROMETERS, Recording
Fried & Lustig
Mason-Neilan Regulator
Rascher & Betzold
Ruehfel Co.
Testrite Instrument Co.
Weksler Thermometer

HYDROMETERS, Thermo (See Hydrometers, Indicating)

HYGROMETERS (Hair, etc.) Indicating
American Moistening Co.
Bristol Co.
Brown Inst. Co.
Cambridge Inst. Co.
Central Scientific Co.
Consol. Ashcroft Hancock
Foxboro Co.
Fried & Lustig
Friez & Sons
Fuess, Inc.
Glogau & Co.
G. M. Mfg. Co., Inc.
Green, Henry J.
Huddleston, J. S. F.
Johnson Service Co.
Palmer Co.
Parks-Cramer Co.
Mason-Neilan Regulator
Moeller Instrument Co.
Muter Company
Parks-Cramer Co.
Phila. Thermometer Co.
Precision Therm. & Inst.
Rieker Inst. Co.
Sargent & Co.
Scientific Inst. Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Weksler Thermometer
Wilder Sales Co.

HYGROMETERS, Recording
Bristol Co.
Brown Inst. Co.
Cambridge Inst. Co. (Cont'd)

HYGROMETERS, Recording (Cont'd)
Consol. Ashcroft Hancock
Foxboro Co.
Friez & Sons
Fuess, Inc.
Green, Henry J.
Leeds & Northrup Co.
Mason-Neilan Regulator
Moeller Instrument Co.
Scientific Inst. Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.

HYGROSTATS
American Moistening Co.
Barber-Coleman Co.
Central Scientific Co.
Friez & Sons
Johnson Service Co.
Parks-Cramer Co.
Penn Elec. Switch Co.
Powers Regulator Co.

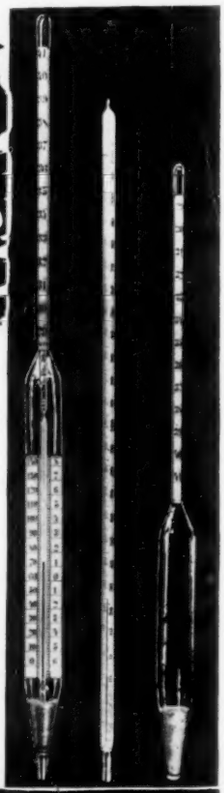
HYGRO-THERMOGRAPHS
Central Scientific Co.
Foxboro Co.
Fuess, Inc.
Friez & Sons
Green, Henry J.

HYPSOMETERS
Central Scientific Co.
Keuffel & Esser Co.
Warren-Knight Co.

ICE WARNING, Indicators
Kollsman Inst. Co.

IGNITION VELOCITY METERS
Hays Corp.
Southw'n Electronics Labs.

HYDROMETERS AND THERMOMETERS



● Accuracy and Dependability are far more important today than they have ever been. We are now able to offer improved **Hydrometers** and **Thermometers** which will withstand the most rigid tests.

All our instruments are covered by an unqualified guarantee to be perfect and accurate within the limits of recognized standards for such instruments.

Send for Catalogue C-40 on new and improved instruments

GEORGE RUEHFEL COMPANY, Inc.

103-105 Menahan Street • Brooklyn, N. Y.

.005 pH . . . EASY *to read on the* CAMBRIDGE

THE CAMBRIDGE ELECTRON-RAY pH METER provides extreme accuracy. Readings are reproducible to .01 pH. Compact and portable, it operates from any convenient 110 volt A.C. outlet. No waiting for "warm up". Sturdy glass electrode. Electron-Ray null indicator, immune to damage from mismanipulation. Millivolt scale for direct reading of oxidation-reduction potentials. RANGE: 0 to 14 pH and 0 to 1200 millivolts.

For laboratory or plant use in BIOCHEMISTRY, CHEMICAL ANALYSIS, PHARMACOLOGY, SOIL RESEARCH, PAPER MAKING, BREWING, CERAMICS, BAKING, ELECTRO-PLATING, FOOD PRESERVING, MILK PRODUCTS, DYEING, SUGAR MANUFACTURE, TANNING, TEXTILES, WATER PURIFICATION, ETC.

Send for Bulletin 910-EI

CAMBRIDGE INSTRUMENT CO., INC.

Pioneer Manufacturers of Precision Instruments

3732 Grand Central Terminal
New York, N. Y.

For addresses, see pages 66-76

pH Recorders... INDICATORS CONTROLLERS

Automatic instruments which continuously record the effective acidity or alkalinity of many solutions, these Micromax pH Recorders play an important part in modern process control. Besides indicating and recording, they are often equipped for automatic control—to hold pH of solution within certain specified limits.

For testing and research there is a complete line of L&N precision potentiometers, electrodes, galvanometers, etc.

LEEDS & NORTHRUP CO.
4984 STENTON AVENUE, PHILADELPHIA

MEASURING INSTRUMENTS · TELEMETERS · AUTOMATIC CONTROLS · HEAT-TREATING FURNACES

ILLUMINATION CONTROLLERS
Bacon, Emra D.
Betts & Betts
Electronic Lab.
G-M Labs.
Luxtrol Co., Inc.
Paragon Electric Co.
Photobell Corp.
United Cinephone Corp.
Weston Elec. Inst. Corp.

ILLUMINATION INDICATORS
General Elec. Co.
G-M Labs.
Leeds & Northrup Co.
Photobell Corp.
United Cinephone Corp.
Weston Elec. Inst. Corp.

ILLUMINATION RECORDERS
Esterline-Angus Co.
General Elec. Co.
United Cinephone Corp.

IMPACT TESTING MACHINES (See Testers & Testing Machines, Impact)

INCLINOMETERS
Fish-Schurman Co.
Kollsman Inst. Co.
Machlett & Son
Pioneer Instrument Co.
Precision Therm. & Inst.
Rieker Inst. Co.
Ruehfel Co.
Ruska & Co.
Starrett Co.
Warren-Knight Co.

INCLINOMETERS, Bore Hole
Sperry-Sun Well Surveying

INCLINOMETERS, Ship
Mueller Inst. Co.

INDEXES, Base Volume & Base Pressure
American Meter Co.

INDICATORS (Look under the object of measurement and control)

INDICATORS, Engine
American Inst. Co.
Bacharach Industrial Inst.
Baldwin-Southwark Corp.
Bendix Marine Products
Cambridge Inst. Co.
Commercial Engg. Labs.
Crosby Steam Gage Co.
McNab of Bridgeport
Pioneer Instrument Co.
Robertson, 3rd, J. L.
Star Brass Mfg. Co.
Trill Indicator Co.

INDICATORS, Engine Compression
Bacharach Industrial Inst.
Baldwin-Southwark Corp.
Cambridge Inst. Co.
Commercial Engg. Labs.
G. M. CO Mfg. Co.
RCA Manufacturing Co.
Trill Indicator Co.

INDICATORS.-Ignition Lag
American Inst. Co.

INDICATORS, Multiple Recording
Commercial Engg. Labs.

INDICATORS, Rate of Climb
American Askania Corp.
Kollsman Inst. Co.
Pioneer Instrument Co.
Rieker Inst. Co.

INDICATORS, Sound
Amperite Corp.
Clough-Brengle Co.
Daven Co.
Electronic Design Corp.
Jones-Orme Co.

INDUCTANCE METERS
Andrew, Victor J.
Industrial Instruments
Leeds & Northrup Co.
Premier Crystal Labs.
RCA Manufacturing Co.
Rubicon Co.
Shallcross Mfg. Co.
Sickles Co.
United Transformer Corp.

INSPECTION DEVICES, AUTOMATIC, Color
Electric Sorting Mach. Co.

INSPECTION DEVICES, AUTOMATIC, Concentricity
Federal Prod. Corp.
Luxtrol Co., Inc.

INSPECTION DEVICES, AUTOMATIC, Cylindricality
Federal Prod. Corp.
Heyman Co.
Luxtrol Co., Inc.

INSPECTION DEVICES, AUTOMATIC, Diameter
Heyman Co.
Instrument Specialties Co.
Luxtrol Co., Inc.
Gaertner Scientific Corp.

INSPECTION DEVICES, AUTOMATIC, Dimensions
Gaertner Scientific Corp.
Heyman Co.
Luxtrol Co., Inc.

INSPECTION DEVICES, AUTOMATIC, Hardness
Brabender Corp.
Detroit Testing Mach.
Saxl Inst. Co.

INSPECTION DEVICES, AUTOMATIC, Insulated Wire
Comtor Co.

INSPECTION DEVICES, AUTOMATIC, Smoothness
Electronic Prod. Co.
Physicists Research Co.
Saxl Inst. Co.
Thwing-Albert Inst. Co.

INSPECTION DEVICES, AUTOMATIC, Thickness
Electronic Prod. Co.
Gaertner Scientific Corp.
Heyman Co.
Instrument Specialties Co.
Luxtrol Co., Inc.
Magnetic Gauge Co.
Saxl Inst. Co.
Thwing-Albert Inst. Co.

INSPECTION EQUIPMENT, Arc Welding
Rubicon Co.

INSPECTION EQUIPMENT, Bore Hole
Lenox Inst. Co.

INSPECTORS, MAGNETIC
Annis Co.
Commercial Engg. Labs.
Magnaflux Corp.
Magnetic Analysis Corp.
Rubicon Co.

INSPECTORS, WELDING
Rubicon Co.

INSTRUMENT COVERS
Blossom Mfg. Co.

INSTRUMENT FUSES (See Fuses, Instrument)

INSTRUMENT OILS
Daven Co.
Ferner Co.
Fulcrum Oil Co.
Huisking & Co.
Landis & Gyr, Inc.
Magnus, Mabee & Reynard
Mico Inst. Co.
Nye, Inc., William F.

INSTRUMENT TRANSFORMERS (See Transformers, Instrument)

INSULATION TESTING EQUIPMENT (See Testers, Insulation)

INTERFEROMETERS
Gaertner Scientific Corp.
Jarrel-Ash Co.
Keuffel & Esser Co.
Perkin-Elmer Corp.
Zeiss, Inc., Carl

JACKS, PLUG-IN (See Connectors, Plugs, Clips)

JOB TIMING RECORDERS
Autocall Co.
Esterline-Angus Co.
Stromberg Electric Co.

KERR CELLS (See Cells, Kerr)

KEYS & SWITCHES
Amer. Automatic Electric
Andrew, Victor J.
Beck Bros.
Bunnell & Co.
Clare & Co.
Kellogg Switchboard
Leeds & Northrup Co.
Shallcross Mfg. Co.

KVA INDICATORS
Roller-Smith Co.

KVA RECORDERS
Esterline-Angus Co.
General Elec. Co.
Landis & Gyr, Inc.
Leeds & Northrup Co.
Therm-Electric Meters
Westinghouse Elec. & Mfg.

KYMOGRAPHS
Gorrell & Gorrell
Sargent & Co.

LABORATORY APPARATUS (See Apparatus, Laboratory)

LABORATORY FURNITURE (See Furniture, Laboratory)

LABORATORY GLASSWARE (See Apparatus, Laboratory, Glass)

LABORATORY SUPPLIES (See Apparatus, Laboratory)

LABORATORY MOTORS (See Motors, Laboratory)

LABORATORY OVENS (See Ovens, Laboratory)

LABORATORY PAPERS
Central Scientific Co.
Chart Production Co.
Sargent & Co.
Welch Mfg. Co.

LABORATORY PORCELAIN (See Porcelain, Laboratory)

LACTOMETERS
Central Scientific Co.
Eimer & Amend
G. M. Mfg. Co., Inc.
Moeller Instrument Co.
Precision Therm. & Inst.
Rieker Inst. Co.
Ruth Glass Division
Ruehfel Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Trerice Co.
Welch Mfg. Co.
Zuhr, Inc., Henry

LAUNDER-OMETER
Atlas Elec. Devices Co.

LEAK INDICATORS, Gas & Water (See Gas Leak Indicators)

LENS THICKNESS GAGES
Bausch & Lomb Optical
Chicago Dial Ind. Co.
Fuess, Inc.

LENSES, Astronomical
Clark & Sons
Perkin-Elmer Corp.

LENSES, Burette
Central Scientific Co.
Fish-Schurman Co.
Fisher Scientific Co.
Gaertner Scientific Corp.
G. M. Mfg. Co., Inc.
Microchemical Service
Parr Instrument Co.
Precision Scientific Co.
Precision Therm. & Inst.
Rieker Inst. Co.

LENSES, Low Reflecting Surfaces
National Research Corp.

LENSES, Microscope, etc.
Bausch & Lomb Optical
Gaertner Scientific Corp.
Leitz, Inc.
Pfaltz & Bauer, Inc.
Spencer Lens Co.
Zeiss, Inc., Carl

LENSES, Polarized
Pfaltz & Bauer, Inc.
Polarizing Inst. Co.
Valpey Crystals
Woermann-Schuchhardt
Zeiss, Inc., Carl

Instrument Drives-
FLEXO-ACTION
MOTORIZED REDUCERS
Dependable geared motors for drives, controllers, and agitators. Precision cut gears, sealed in oil. Quiet, powerful, compact. Priced properly for your product.
SPEEDS: Practically any speed, down to a fraction of a revolution a second, minute, hour, or day.
MOTORS: Induction, synchronous, d.c., universal, or reversing motors, for nearly any voltage or cyclage.
TORQUES: For small or large instruments, minute up to 150 pound inch loads. Where stamina counts.
MERKLE-KORFF GEAR CO.
214 N. MORGAN ST. CHICAGO, ILL.

pH *for*

CONTINUOUS RECORDS *with* LABORATORY ACCURACY

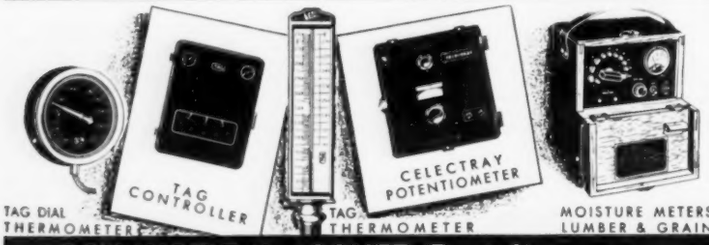
- BOILER PLANTS
- CHEMICAL PLANTS
- OIL REFINERIES
- PAPER MILLS
- SUGAR REFINERIES
- TEXTILE MILLS
- WATER PURIFICATION
- ALL PROCESSING INDUSTRIES

CAMBRIDGE THERMIONIC pH RECORDER is built to give dependable operation under industrial conditions. It incorporates design features that insure accuracy and trouble-free performance to a degree hitherto unknown. Recorder can be located any reasonable distance from the sample point. Sampling solution will not clog continuous flow type chamber containing glass electrode; vapor-tight housing enables electrode installation wherever wanted.

Send for Bulletin 910-T1

CAMBRIDGE INSTRUMENT CO., INC. 3732 Grand Central Terminal New York, N. Y.
Pioneer Manufacturers of Precision Instruments

For addresses, see pages 66-76



TAG INDICATING INSTRUMENTS

FOR TEMPERATURE, PRESSURE, pH, LEVEL, FLOW AND MOISTURE

Calibrated against recognized standards of highest authority, TAG Indicating Instruments maintain a precise accuracy throughout their ranges.

State your indicating instrument needs and we will suggest the proper type for most economical service in your plant.

C. J. TAGLIABUE MFG. CO.
Park & Nostrand Avenues, Brooklyn, N. Y.

LOOK INSIDE the COVER (Part 1) For a COMPLETE LIST of TAG INSTRUMENTS TAG

LENSES, Thermometer (See Lenses, Burette)

LEVELS, Circular Spirit
Dietzen Co.
Geier & Bluhm, Inc.
Glogau & Co.
Gurley, W. & L. E.
Keuffel & Esser Co.
Ruehfel Co.
Warren-Knight Co.
White Co., Inc., David

LEVELS, Dumpy (See Surveying Instruments)

LEVELS, Engineer's (See Surveying Instruments)

LEVELS, Hand
Alpha Instrument Co.
Bostrom-Brady
Dietzen Co.
Gurley, W. & L. E.
Keuffel & Esser Co.
Leupold, Volpel & Co.
Pittsburgh Inst. & Mach.
Starrett Co.
United States Blue Print
Warren-Knight Co.
Weber Co., F.
White Co. Inc., David

LEVELS, Precision
Alpha Instrument Co.
Berger & Sons
Fish-Schurman Co.
Glogau & Co.
Gurley, W. & L. E.
Kern Co.
Keuffel & Esser Co.
Leupold, Volpel & Co.
Moeller Inst. Co.
Ricker Instrument Co.
Scherr Co., Inc.
Starrett Co.
Warren-Knight Co.
Weber Co., F.
White Co. Inc., David
Zeiss, Inc., Carl

LEVELS, Prism
Fecker, J. W.
Kern Co.
Keuffel & Esser Co.
Taylor Inst. Cos.
White Co. Inc., David

LEVELS, Surveying (See Surveying Instruments)

LEVELS, Wye (See Surveying Instruments)

LIGHT METERS
De Jur-Amsco Corp.
General Elec. Co.
Luxtrol Co., Inc.
Pfaltz & Bauer, Inc.
Photobell Corp.
Pho-Tron Inst. Co.
Weston Elec. Inst. Corp.
Welch Mfg. Co.

LIGHT SOURCES, Carbon Dioxide
Barkon-Frink
General Physical Lab.

LIGHT SOURCES, "Daylight"
Barkon-Frink
Frober-Faybor Co.
General Elec. Co.
Macbeth Daylighting Co.
General Physical Lab.

LIGHT SOURCES, Incandescent
Barkon-Frink
Bausch & Lomb Opt.
Fredericks, George
Gaertner Scientific Co.
General Elec. Co.
General Physical Lab.
G-M Labs.
Leitz, Inc., E.
Luxtrol Co., Inc.
United Cinephone Corp.

LIGHT SOURCES, Mercury Vapor
American Inst. Co.
Barkon-Frink
Bausch & Lomb Opt.
Central Scientific Co.
Fish-Schurman Co.
Gaertner Scientific Corp.
Gen. Elec. Lamp Dept.
General Physical Lab.
Hanovia Chem. & Mfg.
Jarrell-Ash Co.
Leitz, Inc.
Mico Instrument Co.
Pfaltz & Bauer, Inc.
Polarizing Instrument
United Cinephone Corp.

LIGHT SOURCES, Monochromatic
Akatos, Inc.
American Inst. Co.
Bausch & Lomb Opt.
Central Scientific Co.
Fish-Schurman Co.
Fuess, Inc.
Gaertner Scientific Corp.
Gen. Elec. Lamp Dept.
General Physical Lab.
Jarrell-Ash Co.
Mico Instrument Co.
Pfaltz & Bauer, Inc.
Polarizing Instrument
Van Keuren Co.
United Cinephone Corp.

LIGHT SOURCES, Neon
Barkon-Frink
Fredericks, George
Gen. Elec. Lamp Dept.
General Physical Lab.
United Cinephone Corp.
Xervac Inst. Co.

LIGHT SOURCES, Sodium
Akatos, Inc.
Central Scientific Co.
Fredericks, George
Gaertner Scientific Corp.
Gen. Elec. Lamp D
Jarrell-Ash Co.
Leitz, Inc.
Pfaltz & Bauer, Inc.
United Cinephone Corp.
Zeiss, Inc., Carl

LIGHT SOURCES, Ultra-Violet
American Inst. Co.
Atlas Electric Devices
Central Scientific Co.
Fredericks, George
Gaertner Scientific Corp.
General Physical Lab.
Hanovia Chem. & Mfg.
Jarrell-Ash Co.
Laboratory Specialties, Inc.
Leitz, Inc.
Mico Instrument Co.
Pfaltz & Bauer, Inc.
United Cinephone Corp.
Westinghouse X-Ray Co.

LIGHT SOURCES, White Light
Barkon-Frink
Fredericks, George
Gaertner Scientific Corp.
Gen. Elec. Lamp Dept.
General Physical Lab.
United Cinephone Corp.

LIGHTHOUSE INSTRUMENTS
Am. Gas Accumulator
Triumph Mfg. Co.
Wallace-Tiernan

LIGHT WAVE MEASURING EQUIPMENT
Gaertner Scientific Corp.
Van Keuren Co.

LINE CURRENT TEST SETS (See Testing Sets, Line Current)

LINEAR FOOTAGE METERS (See Counters, Footage)

LIQUID LEVEL, Indicators & Recorders (See Gages, Liquid Level)

LIQUID METERS, INFERENTIAL TYPES (See Flowmeters)

LIQUID METERS, POSITIVE TYPES (See Meters, Liquid . . . .)

LOUVER OPERATING DEVICES
Arca Regulators, Inc.
Brown Inst. Co.
Fisher Governor Co.
Foxboro Co.
Friez & Sons
General Controls Co.
Hagan Corp.
Hanlon-Waters, Inc.
Mason-Neilan Regulator
Minneapolis-Honeywell
Natural Gas Equipment

LUMBER COUNTERS (See Counters, Lumber)

LUSTER METERS
Akatos, Inc.
Leitz, Inc.
Saxl Inst. Co.
United Cinephone Corp.

MACHINIST'S SQUARES (See Squares, Machinist's)

MAGNETIC INSPECTORS (See Inspectors, Magnetic)

MAGNETOMETERS
American Askania Corp.
Baird Associates
Builders Iron Foundry
Cambridge Inst. Co.
Geophysical Inst. Co.
Welch Mfg. Co.

MAGNIFIERS
Bausch & Lomb Optical
Fish-Schurman Co.
Fuess, Inc.
Glogau & Co.
G. M. Mfg. Co., Inc.
Keuffel & Esser Co.
Kollmorgen Optical Co.
Speidel & Co.
Spencer Lens Co.
Testrite Instrument Co.
Warren-Knight Co.
Weber Co., F.
Zeiss, Inc., Carl

MALT TESTING APPARATUS (See Testers, Malt)

MANOMETERS, High Pressure
Daniel Orifice Fitting

MANOMETERS, Inclined Tube
American Blower Corp.
Bacharach Industrial Inst.
Bailey Meter Co.
Consol. Ashcroft Hancock
Defender Automatic Reg.
Detroit Air Meter Co.
Dwyer Mfg. Co.
Friez & Sons
Fuess, Inc.
Hays Corp.
H-B Inst. Co., Inc.
Meriam Co.
Precision Therm. & Inst.
Uehling Inst. Co.

MANOMETERS, Micro
Bacharach Industrial Inst.
Cambridge Inst. Co.
Fuess, Inc.
Welch Mfg. Co.

MANOMETERS, Remote-reading
Bailey Meter Co.
Brown Inst. Co.
Uehling Inst. Co.

MANOMETERS, Single-tube & Reservoir
Ace Glass Inc.
Bacharach Industrial Inst.
Bailey Meter Co.
Commercial Engg. Labs.
Connelly Iron Sponge Co.
Defender Automatic Reg.
Detroit Air Meter Co.
Dwyer Mfg. Co.
Friez & Sons, Julien
Gas Appliance Specialties
Lantz-Phelps Corp.
Meriam Co.
Morey & Jones, Ltd.
Precision Therm. & Inst.
Scientific Inst. Co.
Simplex Valve & Meter
Uehling Inst. Co.

MANOMETERS, U-tube, Electric Transmitting
Brown Inst. Co.
Bailey Meter Co.
Precision Therm. & Inst.
Southw'n Electronics Labs.

MANOMETERS, U-tube, Glass
Ace Glass, Inc.
Annis Co.
Bacharach Industrial Inst.
Builders Iron Foundry
Connelly Iron Sponge
Consol. Ashcroft Hancock
Defender Automatic Reg.
Detroit Air Meter Co.
Dwyer Mfg. Co.
Eimer & Amend
Fish-Schurman Co.
Fisher Scientific Co.
Friez & Sons, Julien
Gotham Inst.
Hays Corp.
Jensen Inst. Co.
Kimble Glass Co.
Lambert Meter Co.
Macalaster Bicknell Co.
Machlett & Son
Meriam Co.
Mine Safety Appliances
Moeller Instrument Co.
Morey & Jones, Ltd.
Precision Therm. & Inst.
Rascher & Betzold
Refinery Supply Co.
Ruth Glass Division
Sargent & Co.
Scientific Inst. Co.
Simplex Valve & Meter
Specialty Glass Co.
Tagliabue Mfg. Co.
Trerice Co.
Uehling Inst. Co.
Vapor Recovery Systems
Wilkens-Anderson Co.

MANOMETERS, U-tube, Metal
Cambridge Inst. Co.
Connelly Iron Sponge
Mason-Neilan Regulator
Precision Therm. & Inst.
Scientific Inst. Co.
Taylor Inst. Cos.

MAP MAKING PROJECTORS
Bausch & Lomb Optical
Spencer Lens Co.

MARINE INSTRUMENTS (See Nautical Instruments)

MARINE INSTRUMENTS, Gyro-Compass & Gyro-Pilot
Sperry Gyroscope **Co.**

MASTER CLOCKS (See Clocks, Master)

MEASURING MACHINES, Lineal
Bausch & Lomb Opt.
Durant Mfg. Co.
Ferner Co.
Fidelity Mach. Co.
Gaertner Scientific Corp.
Pratt & Whitney

MEASURING MACHINES, Wire
Durant Mfg. Co.
Minneapolis Elec. & Const.
Pratt & Whitney

MEGOHMMETERS
Biddle Co., Jas. G.
Cambridge Inst. Co.
Clough-Brengle Co.
General Elec. Co.
General Radio Co.
Ill. Testing Labs.
Industrial Instruments
Martindale Electric Co.
Rawson Electrical Inst.
RCA Manufacturing Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
Sticht & Co.
Weston Elec. Inst. Corp.

MEGOHM VOLTMETERS (See Voltmeters, Megohm)

MELTING POINT APPARATUS
Ace Glass, Inc.
American Inst. Co.
Central Scientific Co.
Corning Glass Works
Eimer & Amend
Ferner Co.
Fisher Scientific Co.
Humboldt Mfg. Co.
Machlett & Son
Microchemical Service
Parr Instrument Co.
Pfaltz & Bauer, Inc.
Precision Scientific Co.
Scientific Glass Apparatus
Tagliabue Mfg. Co.
Western Machinery Co.

METAL DETECTORS (See Detectors, Metal)

METALLIC BELLOWS (See Bellows, Metallic)

METALS, Thermostatic
Chace Co.
General Plate

METEOROLOGICAL INSTRUMENTS
American Askania Corp.
American Inst. Co.
Am. Paulin System
Friez & Sons
Fuess, Inc.
Geophysical Instrument
G. M. Mfg. Co., Inc.
Green, Henry J.
Moeller Instrument Co.
Precision Therm. & Inst.
Taylor Inst. Cos.
Weksler Thermometer

METER LEVELING SADDLES
Robinson Orifice Fitting

METER PROVERS, Gas
American Meter Co.
Lambert Meter Co.
Pgh. Equitable Meter Co.

METER STICKS
Lufkin Rule Co.
Weber Co.

METERS, Acid (See Acidimeters)

METERS, Ampere Hour (See Ampere Hour Meters)

METERS, Coal (See Coal Meters)

METERS, Compressed Air
American Meter Co.
Bailey Meter Co.
Mason-Neilan Regulator
N. J. Meter
Taylor Inst. Cos.

METERS, Condensation
Am. Dist. Steam Co.
Bailey Meter Co.
Buffalo Meter Co.
Central Station Steam
Henszey Co.
Taylor Inst. Cos.

METERS, Conductivity (See Conductivity Meters)

METERS, Consumer's, Electric
General Elec. Co.
Westinghouse Elec. & Mfg.

METERS, Consumer's, Gas
American Meter Co.
Lambert Meter Co., Inc.

METERS, Current, Air & Gas
American Meter Co.
Mason-Neilan Regulator
Pgh. Equitable Meter Co.

METERS, Current, Liquid
American Meter Co.
Bowser & Co.
Builders Iron Foundry
Eclipse Aviation
Keuffel & Esser Co.
Mason-Neilan Regulator
National Meter Co.
Neptune Meter Co.
Pgh. Equitable Meter Co.
Scientific Inst. Co. (Calif.)
Uehling Instrument Co.
Worthington-Gamon Meter

METERS, Decibel (See Sound Level Meters)

METERS, Demand, Electric
Electric Indicator Co.
Esterline-Angus Co.
General Elec. Co.
HD Elec. Co.
Landis & Gyr, Inc.
Lincoln Meter Co.
Sangamo Electric Co.
Therm-Electric Meters
Westinghouse Elec. & Mfg.

METERS, DEMAND, Gas
American Meter Co.
Bailey Meter Co.
Bendix Marine Products
Lambert Meter Co.
Mason-Neilan Regulator
Pgh. Equitable Meter Co.

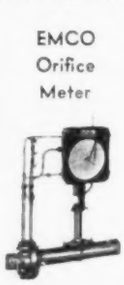
METERS for GAS—WATER—OIL—GASOLINE

GAS PRESSURE REGULATORS

Pittsburgh Water Meter

Pittsburgh Piston Gasoline Meter

EMCO Domestic Gas Meter


EMCO Orifice Meter

EMCO Ejector Gas Service Regulator

PITTSBURGH EQUITABLE METER CO., 400 N. Lexington Ave., Pittsburgh, Pa

For addresses, see pages 66-76

NEW! *Quick—accurate readings—Direct—no addition of liquid levels*

Trimount Direct Reading "U" type manometer

Here's precision built "U" type manometer that gives instantaneous readings with the flick of the wrist. Scale reads *direct* in inches and tenths—no addition of liquid levels needed. Saves time—eliminates errors. Operates on simple, unique sliding scale principle. Made in wide range of standard sizes from 15" to 100" for all pressures for use with mercury, oil or water. Cost very little more than ordinary fixed scale manometers. Write for catalog B-2.

Trimount Instrument Co.
332 S. LaSalle St., Chicago, Ill.

TRIMOUNT MANOMETERS

NIAGARA METERS

Single nutating piston volumetric displacement type, with integrating registers.

For all liquids, including:

- COLD WATER
- HOT WATER
- OILS
- ALCOHOL
- ALKALIS
- MOST ACIDS
- SOLVENTS
- GASOLINE

BUFFALO METER CO.
2906 Main St. Buffalo, N. Y.

FOXBORO
Reg. U. S. Pat. Off.
METERS

A complete line of Flow Meters for steam, gas, air, oil, water, acids and other fluids. Orifice type – simple in design, powerful, with a straight-line motion that assures permanent calibration, long life. Can be furnished with integrator to give total flow. Recorders may also be equipped with pressure, temperature and integrator pens.

Write for Bulletin Nos. 200-5 and 692. **The Foxboro Company, 46 Neponset Avenue, Foxboro, Mass., U. S. A.**

METERS, Demand Limiting, Automatic
American Meter Co.
Annis Co.
Esterline-Angus Co.
General Elec. Co.
Landis & Gyr, Inc.
Lincoln Meter Co.
Mason-Neilan Regulator
Therm-Electric Meter
Westinghouse Elec. & Mfg.

METERS, Earth Current
Geophysical Inst. Co.
Rawson Electrical Inst.
Shallcross Mfg. Co.

METERS, Electronic
Ballantine Labs.
Boonton Radio Corp.
Cambridge Inst. Co.
Clough-Brengle Co.
Luxtrol Co., Inc.
RCA Manufacturing Co.
Weston Elec. Inst. Co.

METERS, Flow (See Flowmeters)

METERS, Footage (See Counters, Footage)

METERS, Foot-candle (See Foot-candle Meters)

METERS, Frequency (See Frequency Meters)

METERS, Gas (See Gas Meters)

METERS, Gas, Dry Test
American Meter Co.
Lambert Meter Co.
Pgh. Equitable Meter Co.
Tagliabue Mfg. Co.

METERS, Gas, Integrating
American Meter Co.
Bailey Meter Co.
Brown Inst. Co.
Foxboro Co.
Lambert Meter Co.
Mason-Neilan Regulator
Tagliabue Mfg. Co.
Taylor Inst Cos.

METERS, Gas, Wet Test
American Meter Co.
Lambert Meter Co.
Tagliabue Mfg. Co.

METERS, Gas, Station
American Meter Co.
Bowser & Co.
Pgh. Equitable Meter Co.

METERS, Gasoline (See Meters, Liquid)

METERS, High Pressure & High Pressure Distribution
Pgh. Equitable Meter Co.
Simplex Valve & Meter

METERS, Hydrogen Ion (See Hydrogen Ion Determination Instruments)

METERS, LIGHT (See Foot-candle Meters, Illumination Indicators and Recorders, Light Meters, etc.)

METERS, Liquid, Volumetric Types, Nutating Disk
Badger Meter Co.
National Meter Co.
Neptune Meter Co.
Pgh. Equitable Meter
Read Machinery Co.
Worthington Gamon

METERS, Liquid, Volumetric Types, Nutating Piston
Buffalo Meter Co.
National Meter Co.
Neptune Meter Co.
Worthington Gamon

METERS, Liquid, Volumetric Types, Oscillating Piston
Badger Meter Co.
Brodie Co., Inc.
Campion Labs.
National Meter Co.
Neptune Meter Co.
Worthington-Gamon Met.

METERS, Liquid, Volumetric Types, Reciprocating Piston
Bowser & Co., Inc.
Ralph N. Brodie Co., Inc.
Pgh. Equitable Meter
Ruska & Co., Inc.
Worthington Gamon

METERS, Liquid, Volumetric, Rotary Piston
Badger Meter Co.
Bowser & Co., Inc.
Neptune Meter Co.
Pgh. Equitable Meter
Smith Meter Co.
Sparling, R. W.

METERS, Liquid, Volumetric, Special for Extremely Low Flow
Bowser & Co., Inc.
Campion Labs.
Commercial Eng. Labs.
Fluid Meters, Inc.
Gauthier, Donat A.
McCord Radiator & Mfg.
National Meter Co.

METERS, Liquid, Weighing
Richardson Scale Co.

METERS, Mileage
Gauthier, Donat A.
Houser Engg. & Mfg. Co.
Jaeger Watch Co.
Ohmer Register
Veeder-Root, Inc.

METERS, Multi-Rate
Landis & Gyr, Inc.

METERS, Oil (See Meters, Liquid)

METERS, Orifice (See Flowmeters, Orifice)

METERS, Oxygen (See I—Gas Analyzer; 2—Gas Meters)

METERS, Pitot Tube (See Flowmeters, Pitot Tube)

METERS, Positive Displacement (See Gas Meters, Positive and Liquid Meters, Volumetric)

METERS, Prepayment
American Meter Co.
Landis & Gyr, Inc.

METERS, Proportional
American Meter Co.
Bristol Co.
Foxboro Co.
Mason-Neilan Regulator
National Meter Co.
Pgh. Equitable Meter Co.
Taylor Inst. Cos.

METERS, Reactive Component
Andrew, Victor J.
General Elec. Co.
Landis & Gyr, Inc.
Therm-Electric Meters C
Westinghouse Elec. & Mfg.

METERS, Rotary Displacement
Bowser & Co.
Neptune Meter Co.
Pgh. Equitable Meter Co.

METERS, Sewage
American Meter Co.
Bailey Meter Co.
Brown Inst. Co.
Builders Iron Foundry
Mason-Neilan Regulator
Morey & Jones, Ltd.
Pgh. Equitable Meter Co.
Simplex Valve & Meter
Taylor Inst. Cos.

METERS, Shunt
Builders Iron Foundry
Columbia Elec. Mfg.
Daven Co.
Instrument Resistors
Rawson Electrical Inst.
Wheelco Inst. Co.

METERS, Station
American Meter Co.

METERS, Steam (See Flowmeters, Steam)

METERS, Time
Campion Labs.
Cramer & Co., Inc.
Elec. Tachometer Corp.
General Elec. Co.
Jaeger Watch Co.
Luers, J. Milton
National Instrument Co.
Paragon Electric Co.
Rawson Electrical Inst.
Thompson Clock Co.
Warren Telechron Co.
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.

METERS, Ultraviolet Radiation
General Elec. Co.
Westinghouse Elec. & Mfg.

METERS, Venturi (See Flowmeters, Venturi)

METERS, V-notch (See Flowmeters, Weir)

METERS, Volumetric, Positive Displacement (See Gas Meters, Positive; see Meters, Liquid, Volumetric)

METERS, Water (See Liquid Meters, Volumetric; also Flowmeters, Liquid)

METERS, Watt-Hour
Duncan Electric
General Elec. Co.
Landis & Gyr, Inc.
Sangamo Electric Co.
Westinghouse Elec. & Mfg.

METERS, Weir (See Flowmeters, Weir)

MICROAMMETERS (See Ammeters, Microammeters)

MICRODENSITOMETERS
Akatos, Inc.
Dietert Co.
Gaertner Scientific Corp.
Jarrell-Ash Co.
Micro Instrument Co.

MICROFARADMETERS
Biddle Co., Jas. G.
Clough-Brengle Co.

MICRO-MANIPULATORS
Hoffman Co., S. O.
Industrial Instruments
Mico Instrument Co.
Zeiss, Inc., Carl

MICROMANOMETERS (See Manometers, Micro)

MICROMETERS, Calendar
Coats Mach. Tool Co.
Precision Therm. & Inst.

MICROMETERS, Dial
Ames Co., B. C.
Amthor Test. Mach.
Coats Mach. Tool Co.
Exact Weight Scale
Federal Prod. Corp.
Gen. Engg. & Model Wk.
Glogau & Co.
Haines Gauge Co.
Park Sales
Randall, Frank E.
Scherr Co., Inc.
Starrett Co.
Waltham Dial Gage Co.

MICROMETERS, External
Instrument Specialties
Park Sales
Reed Small Tool Works
Slocomb Co., J. T.

MICROMETERS, Filar Eyepiece
Gaertner Scientific Corp.

MICROMETERS, FLYING
Magnetic Gauge Co.

MICROMETERS, Internal
Brown & Sharpe
Coats Mach. Tool Co.
Lufkin Rule Co.
Micro Products Co.
Millers Falls Co.
Pacific Specialty Supply
Reed Small Tool Works
Scherr Co., Inc.
Zeiss, Inc., Carl

MICROMETERS, Optical
Bausch & Lomb Optical
Fish-Schurman Co.
Gaertner Scientific Corp.
Jarrell-Ash Co.
Keuffel & Esser Co.
Leitz, Inc.
Scherr Co., Inc.
Spencer Lens Co.
Zeiss, Inc., Carl

MICROMETERS, RADIO
Sensitive Research Inst.

MICROPHONES
Amperite Co.
Brush Development
Kellogg Switchboard
Leich Electric
Miles Reproducer
Shure Bros.
Sundt Engg.

MICROPROJECTOR
Bausch & Lomb Optical
Jones & Lamson Mach.
Wilder, Inc.

MICROSCOPE ACCESSORY INSTRUMENTS
Bausch & Lomb Optical
Gaertner Scientific Corp.
Leitz, Inc.,
Microchemical Service
Pfaltz & Bauer, Inc.
Spencer Lens Co.
Zeiss, Inc., Carl

MICROSCOPE ILLUMINATORS
Bausch & Lomb Optical
Central Scientific Co.
Gen. Elec. Lamp Dept.
Leitz, Inc.
Pfaltz & Bauer, Inc.
Spencer Lens Co.
Zeiss, Inc., Carl

MICROSCOPE SLIDES (Prepared)
Central Scientific Co.
Chicago Apparatus Co.
Clay-Adams Co.
Fish-Schurman Co.
Gaertner Scientific Corp.
Gen. Biological Supply
Ricker Instrument Co.
Spencer Lens Co.
Welch Mfg. Co.

MICROSCOPES, Ballistic Comparison
Bausch & Lomb Optical
Leitz, Inc.
Spencer Lens Co.
Zeiss, Inc.

MICROSCOPES, Binocular
Bausch & Lomb Optical
Fuess, Inc.
Leitz, Inc.
Pfaltz & Bauer, Inc.
Scherr Co., Inc.
Spencer Lens Co.
Zeiss, Inc., Carl

MICROSCOPES Biological (See Microscopes, Binocular)

MICROSCOPES, Brinell
Bausch & Lomb Optical
Detroit Testing Mach.
Fisher Scientific Co.
Fuess, Inc.
Gaertner Scientific Corp.
Holz, Herman A.
Leitz, Inc.
Pittsburgh Inst. & Mach.
Riehle Division
Suter, Alfred

MICROSCOPES, Dark Field
Bausch & Lomb Opt.
Spencer Lens Co.

For addresses, see pages 66-76

MOISTURE INDICATOR . . . *HAND MODEL has many applications*

CAMBRIDGE HAND MODEL MOISTURE INDICATOR, when exposed to the air, measures its Relative Humidity. This instrument quickly indicates moisture content of various hygroscopic materials such as **PAPER, TEXTILES, GRAIN, ETC.** It can be calibrated with two scales, one showing percent Relative Humidity and the other percent water. With the **pistol grip** instrument (illustrated) the Relative Humidity of atmosphere, or Moisture Content of materials into which the blade is inserted, may be promptly determined. **Indispensible for checking, if moisture content in a material is specified.**

Send for Literature.

For use in **HAT, TEXTILE, PRINTING, LITHOGRAPHY, FOOD,** *and any industries processing* **CEREALS, WOOL, COTTON, RAYON, FUR, PAPER, ETC.**

CAMBRIDGE INSTRUMENT CO., INC. 3732 Grand Central Terminal
Pioneer Manufacturers of Precision Instruments New York, N. Y.

MICROSCOPES, Finish Comparison
Bausch & Lomb Optical
Fecker, J. W.
Fuess, Inc.
Gaertner Scientific Corp.
Leitz, Inc.
Scherr Co., Inc.
Spencer Lens Co.
Zeiss, Inc., Carl

MICROSCOPES, Inspection (See Microscopes, Finish Comparison)

MICROSCOPES, Measuring
Bausch & Lomb Optical
Central Scientific Co.
Ednal Co.
Fecker, J. W.
Fuess, Inc.
Gaertner Scientific Corp.
Jarrell-Ash Co.
Kern Co.
Leitz, Inc.
Mico Instrument Co.
Scherr Co., Inc.
Triplex Machine Tool
Zeiss, Inc., Carl

MICROSCOPES, Metallographic
Bausch & Lomb Optical
Fuess, Inc.
Leitz, Inc.
Mico Instrument Co.
Pfaltz & Bauer, Inc.
Scherr Co., Inc.
Zeiss, Inc., Carl

MICROSCOPES, Petrographical
Bausch & Lomb Optical
Fuess, Inc.
Leitz, Inc.
Spencer Lens Co.
Zeiss, Inc., Carl

MICROSCOPES, Thread Contour (See Microscopes, Finish Comparison)

MICROSCOPES, Toolmaker's
Bausch & Lomb Optical
Fuess, Inc.
Gaertner Scientific Corp.
Goerz Amer. Optical
Leitz, Inc.

MICROSCOPES, Toolmakers' (Cont'd)
Mico Instrument Co.
Scherr Co., Inc.
Zeiss, Inc., Carl

MICROSCOPES, Wire Gaging
Bausch & Lomb Optical
Zeiss, Inc., Carl

MICROTOMES
Bausch & Lomb Optical
Cambridge Inst. Co.
Central Scientific Co.
International Equip. Co
Leitz, Inc.
Mico Instrument Co.
Pfaltz & Bauer, Inc.
Spencer Lens Co.
Thomas Co., Arthur H.

MICROVOLTMETERS (See Voltmeters, Micro)

MILEAGE METERS (See Meters, Mileage)

MILITARY INSTRUMENTS (See Ordnance Instruments)

MILK TESTERS (See Testers, Milk)

MILLIAMMETERS (See Ammeters, Milliammeters)

MILLIOHMMETERS (See Ohmmeters, Milliohmmeters)

MILLIVOLTMETERS (See Voltmeters, Millivoltmeters)

MINE GAS INDICATORS (See Detectors, Mine Gases)

MIRRORS
Bausch & Lomb Opt.
Clark & Sons
Fecker, J. W.
Fish-Schurman Co.
Fuess, Inc.
Gurley, W. & L. E.
Hathaway Inst. Co.
Keuffel & Esser Co.
Kollmorgen Optical Co.
Laboratory Specialties
Master Optical Co.
Perkin-Elmer Corp.
Pioneer Instrument
Rieker Inst. Co.
United Cinephone Corp.
Warren-Knight Co.

MODULATION METERS
Andrew, Victor J.
General Radio Co.
RCA Manufacturing Co.
Weston Elec. Inst. Corp.

MOISTURE METERS (See also Testers & Testing Machines, Moisture)
Hart Moisture Gages
Tagliabue Mfg. Co.

MOISTURE TESTING APPARATUS (See Testers & Testing Machines, Moisture)

MOLECULAR STILLS
Distillation Prod., Inc.

MONOCHROMATIC LIGHT SOURCES (See Light Sources, Monochromatic)

MONOCHROMATORS
Akatos, Inc.
American Askania Corp.
Baird Associates
Bausch & Lomb Opt.
Fuess, Inc.
Gaertner Scientific Corp.
Leitz, Inc.
Zeiss, Inc., Carl

MOTION INDICATORS
Bristol Co.
Brush Development Co.
Elec. Tachometer Corp.
Foxboro Co.
Mason-Neilan Reg. Co.
Photoswitch, Inc.

MOTION RECORDERS
American Automatic Elec.
Bristol Co.
Brush Development Co.
Elec. Tachometer Corp.
Foxboro Co.
Impact Register
Mason-Neilan Reg. Co.

MOTOR STARTERS (See Starters, Motor)

MOTORS, Fractional H.P.
Barber-Coleman Co.
Bodine Elec. Co.
Eclipse Aviation
Elsbert Mfg. Co.
General Elec. Co.
Holtzer-Cabot Elec.
Merkle-Korff Gear Co.
Warren Telechron Co.

MOTORS, Geared
Merkle-Korff Gear Co.

MOTORS, Laboratory
Bodine Elec. Co.
Central Scientific Co.
Eastern Engg. Co.
General Elec. Co.
L. A. B. Corp.
Maehlett & Son
Merkle-Korff Gear Co.
Parr Instrument Co.
Sargent & Co.
Welch Mfg. Co.

MOTORS, Synchronous
Allis-Chalmers Mfg. Co.
Bendix Marine Products
Bodine Elec. Co.
Columbia Elec. Mfg.
Elec. Indicator Corp.
General Elec. Co.
Holtzer-Cabot Elec.
Merkle-Korff Gear Co.
Sangamo Electric Co.
Warren Telechron Co.

MOUNTINGS, Shock & Vibration Absorbing
Goodrich Co.
Lord Manufacturing Co.

MUD SCALES (See Scales, Mud)

MULTIPLE SCALE METERS
American Elec. Sales Co.
Clough-Brengle Co.
General Elec. Co.
Precision Apparatus Corp.
Rawson Elec. Inst. Co.
Supreme Inst. Corp.
Triumph Mfg. Co.
Western Electro-Mech.

MULTIPLIERS
General Elec. Co.
Instrument Resistors, Inc.
International Resistance
Precision Resistor Co.
Sensitive Research Inst.

NATURAL SCIENCE SUPPLIES
Central Scientific Co.
Chicago Apparatus Co.
Clay-Adams Co.
Welch Mfg. Co.

NAUTICAL INSTRUMENTS
American Paulin System
Baker Compass Co.
Bausch & Lomb Opt.
Bendix Marine Products
Bliss & Co.
Cummings Machine Works
Elec. Tachometer Corp.
Geophysical Inst. Co.
Kenyon Instrument Co.
Kuner Co., Max
Marine Compass Co.
Moeller Instrument Co.
Moisture Register Co.
(Cont'd)

NAUTICAL INSTRUMENTS (Continued)
Negus, T. S. & J. D.
Rieker Instrument Co.
Thompson Clock Co.

NAVAL INSTRUMENTS
Bausch & Lomb Opt.
Bendix Marine Products
Bowser & Co.
Elec. Tachometer Corp.
Geophysical Inst. Co.
Keuffel & Esser Co.
Moeller Instrument Co.
Scientific Inst. Co.

NAVIGATIONAL INSTRUMENTS
Baker Compass Co.
Bausch & Lomb Opt.
Bliss & Co.
Eastern Science Co.
Geophysical Instrument
Keuffel & Esser Co.
Marine Compass Co.
Negus, T. S. & J. D.
Pioneer Instrument Co.

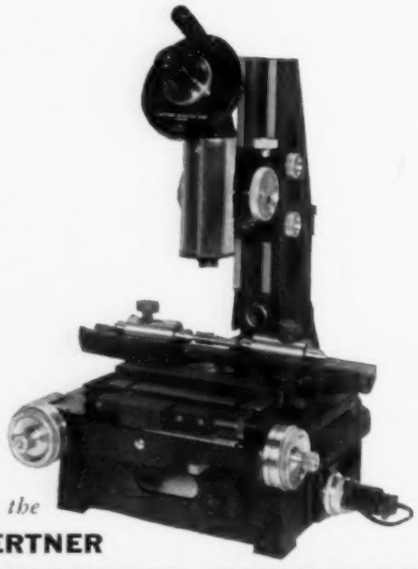
NEEDLES, Asphalt Penetration
Alpha Instrument Co.
Central Scientific Co.
Eimer & Amend
Fisher Scientific Co.
Humboldt Mfg. Co.
Saxl Inst. Co.
Tagliabue Mfg. Co.
Van Keuren Co.

NEEDLES, Dip
Gurley, W. & L. E.

NEEDLES, Gillmore
American Inst. Co.
Central Scientific Co.
Fisher Scientific Co.
Humboldt Mfg. Co.
Riehle Div.
Saxl Inst. Co.

NEEDLES, Penetrometer
Alpha Instrument Co.
Central Scientific Co.
(Cont'd)

Increase . . . **PRODUCTION**
Speed-Up . . . **MEASUREMENT**



With the
GAERTNER
TOOLMAKER MICROSCOPE
Descriptive Bulletin on Request
THE GAERTNER-SCIENTIFIC CORP.
1211 Wrightwood Ave., Chicago, U.S.A.

Rawson Twin Multimeter

29 ranges in less space than any near equivalent combination—size 12" x 8" x 6"
RANGE OF MEASUREMENTS
D.C. 1 microampere to 1 ampere
20 microvolts to 1000 volts
A.C. (up to 3000 cycles)
2 milliamperes to 3 amperes
60 millivolts to 1000 volts
Special apparatus built to order
RAWSON ELECTRICAL INSTRUMENT COMPANY
110 POTTER ST. CAMBRIDGE, MASS.
Branch: 15 East 26th St., New York City
Representative: E. N. Webber
4358 W. Roosevelt Rd., Chicago, Ill.

MOISTURE TESTING MADE FOOL-PROOF
THE SEMI-AUTOMATIC MOISTURE TESTER
An ideal combination of drying oven and analytical balance.
Requires no training—just push down a lever and read the moisture loss from an illuminated dial—directly in percentages.
Accuracy—1/20th of 1%
Capacity—10 Ten gram samples
Temperature ranges—85°C. to 175°C. or 30°F. to 200°F.
Moisture Range—0% to 100%
Heating Capacity—750 Watts
Operating Current—110 volts, 60 cycles, AC (25 cycles or DC if required)
Write for pamphlet
Brabender Corporation Rochelle Park, New Jersey

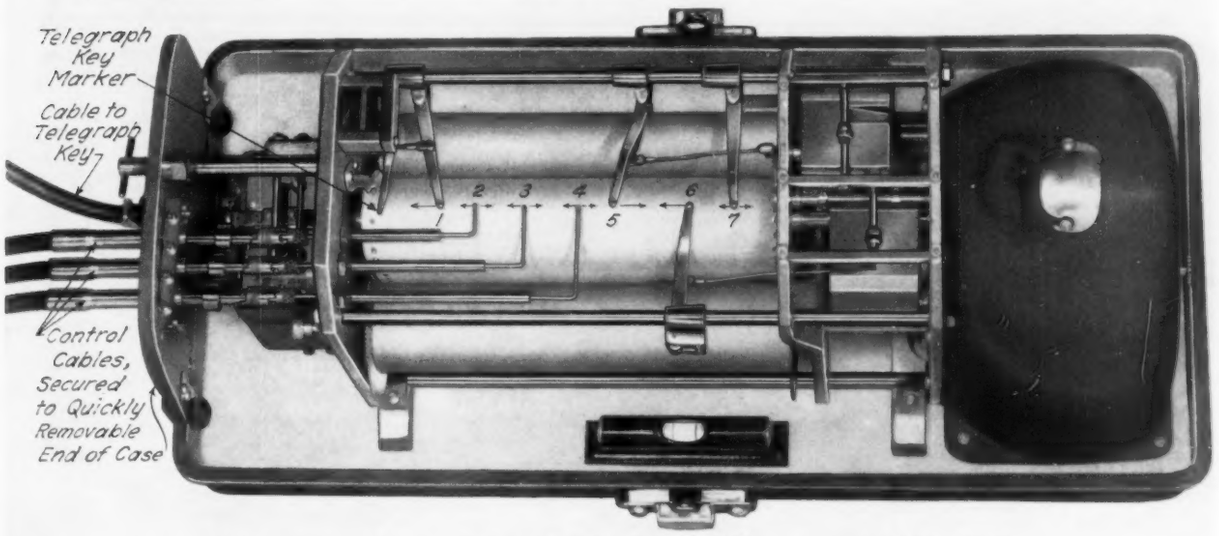
For addresses, see pages 66-76

MOVEMENT RECORDER

THE R-S AIRPLANE ATTITUDE AND CONTROLS MOVEMENT RECORDER

Automatically records on a wax-coated chart:

1-Acceleration Toward Base	2-Elevator Up-Down	3-Ailerons Right-Left	4-Rudder Right-Left	Lateral Attitude: 5-Left Wing Low | 6-Right Wing Low (In either straight or curved flight.)	7-Longitudinal Pitch Up-Down



With cover, size is 7 in. high x 8 in. wide x 17¾ in. long. Weight 20 lb.

Manufactured and Sold by

THE IMPACT REGISTER CO., CHAMPAIGN, ILLINOIS

MOISTURE CONTENT

of

WOOD	CELOTEX
VENEERS	ROOFING FELT
PLYWOOD	LEATHER
PULP	FABRICS
PAPER	WOOL TOPS
CELLOPHANE	CEREALS
GLASSINE	NUTS
PLASTER	SAND

and many other materials can be determined instantly and accurately with one of our small, light, portable, battery-operated gauges.

KAYDEL MOISTURE GAUGES

Made and sold by

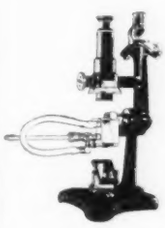
Hart Moisture Gauges, Inc.

126 Liberty St., New York

Spencer Instruments for Industrial Control

Spencer Stereoscopic Microscopes are used for the examination of details too small to be seen by the unaided eyes—to examine impurities or inclusions in raw materials, flaws or irregularities in materials being processed, surface characteristics of finished products. A vivid three dimensional image is obtained.

The Spencer No. 33 Microscope is adaptable to almost any type of microscopic examination and is designed for convenience in quickly changing magnifications or types of illumination, for photomicrography, for measuring, counting or examination of materials.



The Spencer Refractometer provides a quick and accurate method for determining the refractive indices of liquids and solids.

The Spencer No. 41 Polarizing Microscope is used for identification of crystalline materials by means of their optical constants.

Direct Result COLORIMETER is used wherever characteristic color is produced proportional in intensity to the concentration of a substance in solution.

The Spencer Microtomes are used for cutting cross-sections of material for microscopic examination of structure, results of processing, etc.

Write Dept. No. N32 for catalogs describing these instruments more completely.

Spencer Lens Company

MICROSCOPES
MICROTOMES
PHOTOMICROGRAPHIC EQUIPMENT

SPENCER Buffalo N.Y.

REFRACTOMETERS
COLORIMETERS
SPECTROMETERS
PROJECTORS

MOISTURE RECORDER . . . *for use in* CONTINUOUS PROCESSING

GRAPHIC continuous records of Moisture Content of PAPER, CELLULOSE, FABRICS, and other hygroscopic materials manufactured by continuously moving processes are provided by the CAMBRIDGE MOISTURE RECORDER. This instrument operates upon a unique but fundamental principle. It can be calibrated in Relative Humidity or Percentage of Moisture. STANDARD RANGES (R.H.) 10% to 50%, 25% to 50%, 20% to 80%.

For use in
PAPER, TEXTILE, *and* SIMILAR INDUSTRIES.
Send for literature.

CAMBRIDGE INSTRUMENT CO., INC.
Pioneer Manufacturers of Precision Instruments
3732 Grand Central Terminal
New York, N. Y.

NEEDLES, PENETROMETER (Continued)
Eimer & Amend
Fisher Scientific Co.
Humboldt Mfg. Co.
Saxl Inst. Co.
Tagliabue Mfg. Co.
Van Keuren Co.

NEEDLES, Vicat
American Inst. Co.
Central Scientific Co.
Olsen Testing Machine
Fisher Scientific Co.
Humboldt Mfg. Co.
Riehle Div.
Saxl Inst. Co.

NEPHELOMETERS
Akatos, Inc.
Central Scientific Co.
Hellige, Inc.
Klett Mfg. Co.
Leitz, Inc.
Rubicon Co.
Zeiss, Inc., Carl

NESSLER TUBES
Ace Glass Inc.
Central Scientific Co.
Fish-Schurman Co.
Fisher Scientific Co.
Hellige, Inc.
Kimble Glass Co.
LaMotte Chemical Prod.

NITROGEN DETERMINATION APPARATUS
Ace Glass Inc.
Central Scientific Co.
Chicago Apparatus Co.
Eimer & Amend
Fisher Scientific Co.
(Cont'd)

NITROGEN DETERMINATION APPARATUS (Continued)
Laboratory Construction
Microchemical Service
Precision Scientific Co.
Rubicon Co.
Sargent & Co.
Scientific Glass Apparatus
Tagliabue Mfg. Co.

NOISE ANALYZING APPARATUS
Aerovox Corp.
Brush Development Co.
Electronic Design Corp.
General Radio Co.
Jones-Orme Co.
Televiso Co.

NOISE MEASURING SETS
Amperite Co.
Ballantine Labs.
Daven Co.
Electrical Research Prod.
Electronic Design Corp.
Ferris Inst. Corp.
General Elec. Co.
General Radio Co.
Jones-Orme Co.
Measurements Corp.
Sound Apparatus Co.

NOISE RECORDING APPARATUS
Brush Development Co.
Esterline-Angus Co.
General Radio Co.
Ruska & Co.
Sound Apparatus Co.

NOZZLES, Flow
American Moistening Co.
Bacharach Indust. Inst.
(Cont'd)

NOZZLES, Flow (Continued)
Bailey Meter Co.
Brown Inst. Co.
Builders Iron Foundry
Cochrane Corp.
Foxboro Co.
Taylor Inst. Cos.

OCTANTS, NAVIGATING
Bausch & Lomb Optical
Kuner Co., Max
Pioneer Instrument Co.

ODOMETERS
Elec. Tachometer Corp.
Knopf, Paul
Ohmer Register Co.

OHMMETERS
Burton Rogers Co.
Clough-Brengle Co.
De Jur-Amsco Corp.
General Elec. Co.
Industrial Inst. Inc.
Leeds & Northrup Co.
RCA Manufacturing Co.
Roller-Smith Co.
Sensitive Research Inst.
Simpson Elec. Co.
Sticht & Co.
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.
Wheelco Inst. Co.

OHMMETERS, Milliohmmeters
Cambridge Inst. Co.
Hickok Elec. Inst. Co.
Rawson Elec. Inst. Co.
Shallcross Mfg. Co.
Triumph Mfg. Co.

OIL, Lubricating for Instruments & Watches
Nye, William F., Inc.

OIL TESTING INSTRUMENTS
American Inst. Co.
Boekel & Co.
Brabender Corp.
Braun Corp.
Central Scientific Co.
Eimer & Amend
Fish-Schurman Co.
Fisher Scientific Co.
Humboldt Mfg. Co.
Industrial Inst. Inc.
Mico Instrument Co.
Moeller Instrument Co.
Moisture Register Co.
Parr Instrument Co.
Precision Scientific Co.
Ruska & Co., Inc.
Sargent & Co.
Scientific Glass App.
Scientific Inst. Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Western Machinery Co.

OPACIMETERS
Akatos, Inc.
American Inst. Co.
Bausch & Lomb Opt.
Electronic Prod. Co.
Eimer & Amend
Luxtrol Co., Inc.
United Cinephone Corp.
Westinghouse Elec. & Mfg.

OPERATION, Indicators
Bristol Co.
Brown Inst. Co.
Elec. Tachometer Corp.

OPERATION, Recorders
American Automatic Elec.
Autocall Co.
Bristol Co.
Brown Inst. Co.
Cramer & Co., Inc.
Dickson Co.
Elec. Tachometer Corp.
Esterline-Angus Co.
Foxboro Co.
Friez & Sons
Gaertner Scientific Corp.
Knopf, Paul
Marsh Corp.
Paragon Electric Co.
Practical Instrument Co.
Tagliabue Mfg. Co.

OPTICAL BENCHES (See Benches, Optical)

OPTICAL FILTERS (See Filters, Optical)

OPTICAL FLATS (See Flats, Optical)

OPTICAL MICROMETERS (See Micrometers, Optical)

OPTICAL PARTS
Akatos, Inc.
Alpha Instrument Co.
Baird Associates
Bausch & Lomb Optical
Bryden Co.
Clark & Sons
Fecker, J. W.
Fish-Schurman Co.
Fuess, Inc.
Gaertner Scientific Corp.
Goerz Amer. Optical Co.
Industro-Scientific Co.
Kern Co.
Kollmorgen Optical Co.
Leitz, Inc.
Machlett & Son
Master Optical Co.
Perkin-Elmer Corp.
Woermann-Schuchhardt

OPTICAL PARTS, Fused Quartz
Thermal Syndicate Ltd.

OPTICAL TESTING INSTRUMENTS (See Testing Instruments, Optical)

OPTIMETERS
Scherr Co., Inc.
Zeiss, Inc., Carl

ORDNANCE INSTRUMENTS
Alpha Instrument Co.
Bausch & Lomb Opt.
Eclipse Aviation
Elec. Indicator Corp.
(Cont'd)

ORDNANCE INSTRUMENTS (Continued)
Fecker, J. W.
Gaertner Scientific Corp.
General Elec. Co.
Kern Co.
Keuffel & Esser Co.
Kollmorgen Optical Co.
United Cinephone Corp.

ORIFICE METERS (See Flow Meters, Orifice)

ORIFICE FITTINGS
Commercial Iron Works
Daniel Orifice Fitting
Robinson Orifice Fitting

ORIFICES, CALIBRATED (See Flowmeters, Orifice)

ORIFICES, ADJUSTABLE
American Meter Co.
Bailey Meter Co.
Scientific Inst. Co.

ORSAT GAS APPARATUS (See Gas Analyzers, Orsat)

ORTHO-TOLIDIN TESTING OUTFIT
Hellige, Inc.
LaMotte Chemical Prod.
Taylor & Co., Inc.

OSCILLATORS, Audio-frequency
Andrew, Victor J.
Cambridge Inst. Co.
Clough-Brengle Co.
Electro-Medical Lab.
Electronic Design Corp.
Electronic Prod. Co.
Ferris Inst. Corp.
General Radio Co.
Geophysical Inst. Co.
Hathaway Inst. Co.
Hickok Elec. Inst. Co.
Jones-Orme Co.
Leeds & Northrup Co.
Measurements, Inc.
RCA Manufacturing Co.
Supreme Instruments
Televiso Co.
Triplett Electrical Inst.
Triumph Mfg. Co.
United Cinephone Corp.
United Transformer Corp.

OSCILLATORS, Radio-frequency
Andrew, Victor J.
Boonton Radio Corp.
Burton-Rogers Co.
Clough-Brengle Co.
Electro-Medical Lab.
Electronic Design Corp.
Ferris Inst. Corp.
General Radio Co.
Geophysical Inst. Co.
Hickok Elec. Inst. Co.
Jackson Electrical Inst.
McFarlin Co.
Measurements Corp.
Precision Apparatus
Premier Crystal Labs.
RCA Manufacturing Co.
Simpson Elec. Co.
Supreme Instruments
Televiso Co.
Triplett Electrical Inst.
Triumph Mfg. Co.
United Cinephone Corp.
Weston Elec. Inst. Corp.

OSCILLOGRAPHS, Automatic
General Elec. Co.
United Cinephone Corp.
Westinghouse Elec. & Mfg.

OSCILLOGRAPHS, Cathode-ray
Batcher, Ralph R.
Clough-Brengle Co.
DuMont Labs., Inc., A.B.
Electro-Medical Lab.
Electronic Design Corp.
Fredericks, George
General Elec. Co.
General Radio Co.
Hickok Elec. Inst. Co.
Jackson Electrical Inst.
Jones-Orme Co.
Raytheon Mfg. Co.
RCA Manufacturing Co.
Supreme Instruments
Triplett Electrical Inst.
Triumph Mfg. Co.
United Transformer Corp.

OSCILLOGRAPHS, Electrostatic
Cambridge Inst. Co.
RCA Manufacturing Co.

OSCILLOGRAPHS, High-vacuum Cathode-ray
Clough-Brengle Co.
DuMont Labs., Inc., A.B.
Electro-Medical Lab.
General Elec. Co.
Jones-Orme Co.
RCA Manufacturing Co.

OSCILLOGRAPHS, Moving-conductor
Baldwin-Southwark Corp.
Cambridge Inst. Co.
Geophysical Inst. Co.
Westinghouse Elec. & Mfg.

OSCILLOGRAPHS, Multi-element
Baldwin-Southwark Corp.
Cambridge Inst. Co.
Electro-Medical Lab.
Engineering Labs., Inc.
General Elec. Co.
Geophysical Inst. Co.
Ruska & Co., Inc.
Westinghouse Elec. & Mfg.

OSCILLOGRAPHS, Piezoelectric
Baldwin-Southwark Corp.
Brush Development Co.
Cambridge Inst. Co.
Electro-Medical Lab.
Engineering Labs.
Geophysical Inst. Co.
Heiland Research Corp.
McFarlin Co.
Ruska & Co., Inc.
Westinghouse Elec. & Mfg.

OSCILLOGRAPHS, Recording
Baldwin-Southwark Corp.
Brush Development Co.
Cambridge Instrument Co.
Electro-Medical Lab.
Engineering Labs., Inc.
General Electric Co.
Geophysical Instrument Co.
Hathaway Inst. Co.
Heiland Research Corp.
Jones-Orme Co.
Ruska & Co., Inc.
Sound Apparatus Co.
Triumph Mfg. Co.
Westinghouse Elec.

OSCILLOSCOPES
Batcher, Ralph R.
Brush Development Co.
Clough-Brengle Co.
DuMont Labs., Inc., A.B.
General Elec. Co.
General Radio Co.
Jackson Electrical Inst.
Jones-Orme Co.
RCA Manufacturing Co.
Ruska & Co., Inc.
Sundt Engg. Co.
Supreme Instruments
Thordarson Elec. Co.
United Transformer Corp.

OUTPUT METERS
Clough-Brengle Co.
Daven Co.
General Radio Co.
Jackson Electrical Inst.
Jones-Orme Co.
RCA Manufacturing Co.
Shallcross Mfg. Co.
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.

OVENS, Controlled atmosphere
Sodemann Heat & Power

OVENS, Crystal Oscillator
Billey Electric Co.
Premier Crystal Labs.
Valpey Crystals

OVENS, Laboratory
Am. Gas Furnace
Boekel & Co.
Brabender Corp.
Braun Corp.
Central Scientific Co.
Dietert Co.
Elec. Heat Control App.
Falstrom Co.
Fish-Schurman Co.
Fisher Scientific Co.
General Combustion Corp.
Gordon Co.
Sargent & Co.
Sodemann Heat & Power
Thomas Co., Arthur H.
Welch Mfg. Co.
Williams Apparatus Co.

Wide choice of cathode-ray instruments to meet demands of practically any oscillograph problem.

★

Complete line of cathode-ray tubes from the small 3-inch type used in portable equipment, to the large 20-inch type for television.

★

An Electronic Switch which makes possible the studying of two or more signals on a single-element cathode ray oscillograph.

★

Consider carefully the new Type 208 Cathode-Ray Oscillograph, which sets new standards for flexibility, adaptability, performance, low price.

★

CATHODE-RAY Equipment

★ As the result of years of co-operation between DuMont engineers and users of their equipment, DuMont offers an unusually-complete line of cathode-ray tubes, cathode-ray oscillographs, and associated equipment. This wide choice of instruments makes it possible to apply the fundamental method of cathode-ray instrumentation, *i.e.*, the plotting of one quantity as a function of another quantity, to practically any problem.

The recently-published DuMont Catalog B, obtainable by writing on your business letterhead, contains invaluable information on the general application of cathode-ray equipment.

DUMONT
ALLEN B. DU MONT LABORATORIES, Inc.
Passaic ★ New Jersey
Cable Address, Wespexlin, New York

For addresses, see pages 66-76

OVENS, Temperature
Central Scientific Co.
Falstrom Co.
Gordon Co.
Mason-Neilan Regulator

OVER & UNDER WEIGHT INDICATORS FOR BEAM SCALES
Howe Scale Co.
Jacobs Bros. Co., Inc.

OXYGEN ANALYZERS (See Gas Analyzers, Oxygen)

OXYGEN & NITROGEN TESTING APPARATUS (See Gas Analyzers, Oxygen & Nitrogen Apparatus)

PAINT HIDING POWER INSTRUMENTS (See Testers & Test. Mach., Paint)

PANELS, Instrument
Bailey Meter Co.
Beck Bros.
Brown Inst. Co.
Clough-Brengle Co.
Consol. Ashcroft Hancock
Daven Co.
Elec. Tachometer Corp.
Falstrom Co.
Foxboro Co.
General Elec. Co.
Hays Corp.
Hickok Elec. Inst.
Jones Motrola Sales
Karp Metal Products Co.
Marsh Corp.
Republic Flow Meters
Tagliabue Mfg. Co.
Triplett Electrical Inst.

PANELS, Radio Test
Burton-Rogers Co.
Clough-Brengle Co.
Daven Co.
Electronic Design Corp.
Falstrom Co.
Ferris Inst. Corp.
Hickok Elec. Inst. Co.
Jackson Electrical Inst.
Precision Apparatus Corp
Triplett Electrical Inst.
Triumph Mfg. Co.

PANTOGRAPHS
Gaertner Scientific Corp.
Henschel & Co.
Keuffel & Esser Co.
Mico Instrument Co.
Speidel & Co.
Warren-Knight Co.
Weber Co.

PASSOMETERS
Keuffel & Esser Co.
Weber Co.
Zeiss, Inc., Carl

PEDOMETERS
Keuffel & Esser Co.
Testrite Instrument Co.
Warren-Knight Co.
Weber Co.

PELLET PRESSES (See Presses, Pellet)

PELORUSES
Bliss & Co.
Keuffel & Esser Co.
Kuner Co., Max
Negus, T. S. & J. D.
Pioneer Instrument Co.
Precision Therm. & Inst.
Warren-Knight Co.

PENETROMETER NEEDLES (See Needles, Penetrometer)

PERISCOPES, Industrial & Smoke
Ess Inst. Co.
Fecker, J. W.
Kollmorgen Optical Co.
Lenox Inst. Co.
Perkin-Elmer Corp.

PERISCOPES, Military & Naval
Fecker, J. W.
Keuffel & Esser Co.
Kollmorgen Optical Co.

PERMEAMETERS, Magnetic
Annis Co.
Cambridge Inst. Co.
Fisher Scientific Co.
General Electric Co.
Hathaway Inst. Co.
Leeds & Northrup Co.
Rubicon Co.
Welch Scientific Co.

PERMEAMETERS, Porosity
Cambridge Instrument
Engineering Labs., Inc.
Fisher Scientific Co.
Ruska & Co., Inc.
Saxl Instrument Co.

pH METERS (see Testers, Hydrogen Ion)

PHASE ANGLE METERS
Andrew, Victor J.
General Elec. Co.
Leeds & Northrup Co.
RCA Manufacturing Co.
Sensitive Research Inst.
Weston Elec. Inst. Corp.

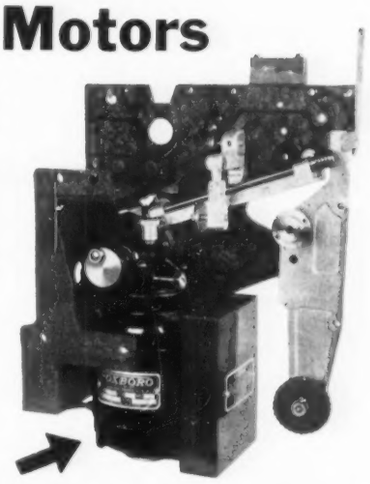
PHASE INDICATORS
Andrew, Victor J.
RCA Manufacturing Co.

For powering their Pyrometers FOXBORO chose these

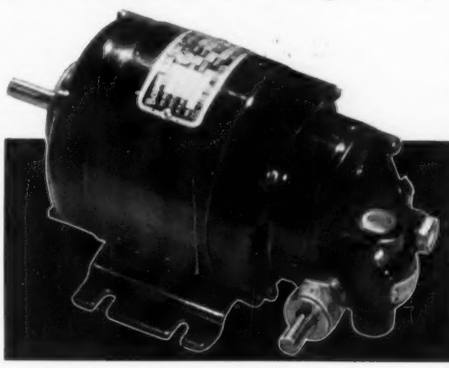
Quiet, Reliable Motors

Makers of quality instruments, such as Foxboro, find in Bodine motors the same high grade materials and workmanship that symbolize their own products. Bodine has more than 3000 types and sizes of instrument motors to select from, ranging from 1/2000 to 1/6 hp, with and without speed reducers. All are fabricated and assembled by expert craftsmen and tested to meet the requirements of the particular application. Their precision-built parts and accurate, permanent alignment insure smooth, quiet operation and long life.

BODINE ELECTRIC COMPANY
2244 West Ohio Street Chicago, Illinois



Drive unit of Foxboro Recording Potentiometer Pyrometer equipped with Bodine speed-reducer motor.



BODINE
FRACTIONAL HORSEPOWER
MOTORS

REHTRON INDUSTRIAL PHOTO ELECTRIC CONTROLS

Adjustable Time Delay • Conveyor • Combustion • Illumination • Safety • Magnetic Counter • Solenoid Valve • Electric Door Operator • Smoke and Turbidity Indicators • Electronic Timers • Burglar Alarms • Annunciators • Advertising Sign Controls.

Applications Engineered for All Industries. Submit Specifications for Literature and Quotations.

REHTRON CORPORATION
2159 MAGNOLIA AVE. CHICAGO, ILL.

CETRON
PHOTO ELECTRIC CELLS
74 TYPES

Mercury Vapor Rectifiers
1 TO 50 AMPERE

We invite your specifications for special photo cell or rectifier requirements.

CONTINENTAL ELECTRIC CO.
GENEVA, ILLINOIS

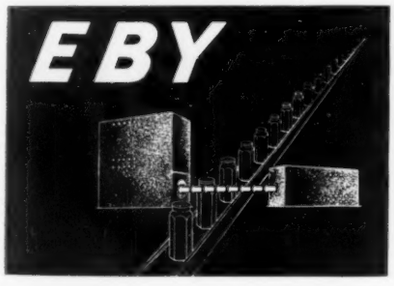


PHOTO-ELECTRIC EQUIPMENT

PROTECTS Operators, machinery, homes, stores, factories, stock rooms, gas stations, garages, storage tanks, etc.

OPERATES Burglar alarms, doors, switches, valves, pumps, brakes, lights, instruments, furnaces and countless other devices.

COUNTS AND ASSORTS According to size, shape or color.

CHECKS Production operations — DETECTS smoke and fires — TIMES sporting events — COUNTS people —ANNOUNCES customers.

Write for Descriptive Literature or for information on your problem.

HUGH H. EBY, Inc.
4700 Stenton Ave. Philadelphia, Pa.

NYE'S WATCH & CLOCK OIL

For INSTRUMENTS

IT is a recognized fact the world over that porpoise jaw oil is the finest crude from which to refine lubricating oil for delicate instruments of precision. When the refining is done by the scientific processes developed through years of experience by Wm. F. Nye, Inc., the result is a specialized oil of the very highest quality.

Nye's Oil—100% American from "fish to finish."

Wm. F. Nye, Inc.
NEW BEDFORD, MASS.
ESTABLISHED 1844

For addresses, see pages 66-76

Potentiometers FOR INSTRUMENT CALIBRATION FOR RESEARCH AND TESTING

Whether for test-room, laboratory or manufacturing department, we have a suitable potentiometer to fit the need. Our complete line includes potentiometers for meter calibration, thermocouple checking, temperature and pH measurement, and various recording and controlling applications. As potentiometer specialists for over 35 years, we offer a selection that is unique in its completeness.

LEEDS & NORTHRUP CO.
4984 STENTON AVENUE, PHILADELPHIA

MEASURING INSTRUMENTS · TELEMETERS · AUTOMATIC CONTROLS · HEAT-TREATING FURNACES

PHASE SEQUENCE INDICATORS
Eastern Specialty Co.
Elec. Facilities Inc.
Ferranti Electric
General Elec. Co.
Meter Devices Co.
Sticht & Co.
Western Electro-Mech.

PHOSPHATE TESTERS (see Testers, Phosphate)

PHOTOELASTICITY POLARISCOPE (See Polariscope, Photoelasticity)

PHOTOELECTRIC CELLS (See Cells, Photoelectric)

PHOTOELECTRIC COLOR ANALYZERS (See Color Analyzers, Photoelectric)

PHOTOELECTRIC COLOR COMPARATORS (See Color Comparators, Photoelectric)

PHOTOELECTRIC CONTROLS
Eby, Inc.
General Electric
Guardian Electric
Rehtron Corp.
Westinghouse E. & M.
Weston Elec. Inst.

PHOTOGRAPHIC EXPOSURE METERS
De Jur Amsco Corp.
Electronic Prod. Co.
General Elec. Co.
G-M Labs.
Luxtrol Co., Inc.
Rhamstine, J. Thos.
Weston Elec. Inst. Corp.

PHOTOMETERS, Bar
Leeds & Northrup Co.
Gaertner Scientific Corp.

PHOTOMETERS, Candle
Connelly Iron Sponge

PHOTOMETERS, Flicker
Precision Therm. & Inst.

PHOTOMETER, Flicker Disc
Frober-Faybor Co.

PHOTOMETERS, Illumination
Akatos, Inc.
G-M Labs.
Leitz, Inc.

PHOTOMETERS, Micro
Akatos, Inc.
Baird Associates
Cambridge Inst. Co.
Gaertner Scientific Corp.
Hayes Scientific App.
Jarrell-Ash Co.
Mico Instrument Co.

PHOTOMETERS, Neutral Wedge
American Inst. Co.
Gaertner Scientific Corp.

PHOTOMETERS, Photoelectric
American Inst. Co.
Applied Research Labs.
Cambridge Inst. Co.
Central Scientific Co.
De Jur Amsco Corp.
Gaertner Scientific Corp.
General Elec. Co.
G-M Labs.
Jarrell-Ash Co.
Luxtrol Co., Inc.
Parr Instrument Co.
Pfaltz & Bauer, Inc.
Phipps & Bird, Inc.
Rubicon Co.
Southw'n Electronics Labs.
Welch Mfg. Co.
Zeiss, Inc., Carl

PHOTOMETERS, Reflection
Akatos, Inc.
American Inst. Co.
Bausch & Lomb Opt.
Gaertner Scientific Corp.
Munsell Color Co.

PHOTOMETERS, Spectro
Akatos, Inc.
American Inst. Co.
Baird Associates
Bausch & Lomb Opt.
Coleman Electric Co.
Frober-Faybor Co.
Fuess, Inc.
Gaertner Scientific Corp.
Jarrell-Ash Co.
Pfaltz & Bauer, Inc.

PHOTOMETERS, Sphere
Akatos, Inc.
Leeds & Northrup Co.

PHOTOMETERS, Ultraviolet
Bausch & Lomb Opt.
Burt Scientific Labs.
Gaertner Scientific Corp.
Jarrell-Ash Co.

PHOTO-MICROGRAPHIC EQUIPMENT (See Microscopes, Metallographic)

PHYSICAL TESTING MACHINES (See Testers and Testing Machines)

PIPE LOCATORS
Engineering Labs., Inc.
Geophysical Inst. Co.
McFarlin Co.
Water Leak Detector Co.
Western Instrument Co.

PIPETTES (See Apparatus, Laboratory, Glass)

PIPETTES, Mechanical (Equal Discharge)
Scientific Instr. (Calif.)

PISTOL BARREL OPTICAL TESTERS (See Tester, Pistol Barrel Optical)

PITOT TUBE METERS (See Flow Meters, Pitot Tube)

PITOT TUBES (see Flowmeters, Pitot Tube)

PLANE TABLES
Eastern Science Co.
Gurley, W. & L. E.
Kern Co.
Keuffel & Esser Co.
Speidel & Co.
Warren-Knight Co.
Weber Co.

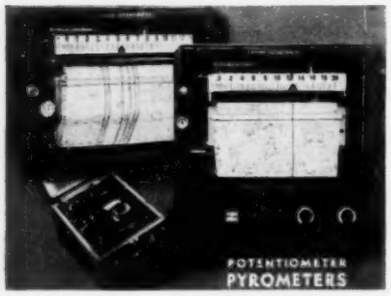
Temperature Measuring Instruments

Wheelco Precision Temperature Measuring Instruments include:

Indicating Pyrometers—Portable Pyrometers—Portable Potentiometers—Recording or Indicating Thermometers—Resistance Thermometers, etc.

Write for complete data on these instruments, today.

Wheelco Instruments Co.
1929-33 S. HALSTED STREET · · · CHICAGO, ILLINOIS



For Controlling, Recording and Indicating Temperatures from —150°F. to +3200°F.

An extremely accurate and dependable instrument, designed and built for industrial service. Operating on the Potentiometer Principle, the instrument can be located practically any distance from the point of temperature measurement (thermocouple location) without affecting its accuracy or dependability.

Charts and scales for a wide variety of ranges are available, from a minimum temperature span of 300° to a maximum span of 3000°F. Corresponding Centigrade scales and charts are also available.

Pyrometer accessories, such as thermocouples and extension lead wire, furnished with instruments to meet the individual requirements of each job.

Write for Catalog 1104. THE BROWN INSTRUMENT COMPANY, *a division of Minneapolis-Honeywell Regulator Co.*, 4482 Wayne Avenue, Philadelphia, Pa.

BROWN PYROMETERS
AND
MINNEAPOLIS-HONEYWELL CONTROL SYSTEMS
To Measure and Control is to Economize

HIGHEST
HICKOK
ACCURACY

Hickok manufactures a complete line of modern up-to-date 6" rectangular switchboard instruments. Voltmeters, ammeters, milliammeters, wattmeters, power factor meters, frequency meters and synchroscopes are available in all ranges. Illuminated dial cases can be furnished which have lamps removable from the front of the case.

Write for complete catalog and prices

HICKOK
ELECTRICAL INSTRUMENT COMPANY
10514 DUPONT AVE., CLEVELAND, OHIO

CALIFORNIA IS UNUSUAL

But not in its insistence on the latest and best in instruments and control devices. In great favor are the products of the following manufacturers:

Ellison Draft Gage Company
General Controls Company, Ltd.
The Mercoid Corporation
Moeller Instrument Company
Wheelco Instruments Co.
Jensen Instrument Co.

SALES

Are expertly engineered and serviced in California.

By The

Jensen Instrument Co.
Since 1923

335 CENTRAL AVENUE LOS ANGELES
420 MARKET STREET SAN FRANCISCO

For addresses, see pages 66-76

Pyrometers ... CONTROLLING RECORDING INDICATING

Micromax is Industry's senior, modern, controlling or recording pyrometer. Dependable, sturdy, low in maintenance, fully automatic. Four models: Strip-Chart and Round-Chart Recording Controllers; Indicating and Non-Indicating Controllers. May use thermocouple, Rayotube (radiation detector) or Thermohm (resistance detector).

Speedomax, ten times as rapid as the usual recording pyrometer, records temperature of objects in motion. L&N Optical Pyrometer is standard for accurate, visual measurements.

LEEDS & NORTHRUP CO.
4984 STENTON AVENUE, PHILADELPHIA

MEASURING INSTRUMENTS · TELEMETERS · AUTOMATIC CONTROLS · HEAT-TREATING FURNACES

PLANIMETERS, Automatic Flow Record
Builders Iron Foundry
Robertson, 3rd., J. L.

PLANIMETERS, Linear
Bacharach Indus. Inst.
Keuffel & Esser Co.
Speidel & Co.
United States Blue Print
Warren-Knight Co.
Weber, Co.

PLANIMETERS, Radial
Bailey Meter Co.
Foxboro Co.
Keuffel & Esser Co.
Speidel & Co.
Trill Indicator Co.

PLANIMETERS, Square Root
Bailey Meter Co.
Foxboro Co.
Henschel & Co.
Keuffel & Esser Co.
Speidel & Co.
Taylor Inst. Cos.

PLUMB BOBS
Alpha Instrument Co.
Brown & Sharpe
Dietzen Co.
Gurley, W. & L. E.
Keuffel & Esser Co.
Millers Falls Co.
Post Co., Frederick
Refinery Supply Co.
Soltmann, Inc.
Speidel & Co.
Starrett Co.
Ulmer Co., J. C.
Warren-Knight Co.
Weber Co.
White Co. Inc.

POLARIMETERS
Akatos, Inc.
Bausch & Lomb Opt.
Central Scientific Co.
Gaertner Scientific Corp.
Jarrell-Ash Co.
Kern Co.
Leitz, Inc.
Pfaltz & Bauer, Inc.
Sargent & Co.
Zeiss, Inc., Carl

POLARISCOPE TUBES (See Tubes, Polariscope)

POLARISCOPES
Akatos, Inc.
Bausch & Lomb Opt.
Gaertner Scientific Corp.
Jarrell-Ash Co.
Pfaltz & Bauer, Inc.
Welch Mfg. Co.

POLARISCOPES, Photoelasticity
Bausch & Lomb Optical
Central Scientific Co.
Fecker, J. W.
Fuess, Inc.
Gaertner Scientific Corp.
Jarrell-Ash Co.
Kollmorgen Optical Co.
Polarized Light & Photo.
Polarizing Instrument
Precision Therm. & Inst.
Woermann-Schuchhardt
Xervac Inst. Co.
Zeiss, Inc., Carl

POLARITY INDICATORS
Ruehfel Co.
Weston Elec. Inst. Corp.

POLARIZING PLATES
Central Scientific Co.
Fuess, Inc.
Polarized Products
Polarizing Instrument
Woermann-Schuchhardt
Zeiss, Inc., Carl

POLISHING MACHINES
American Inst. Co.
Eimer & Amend
Fisher Scientific Co.
Mico Instrument Co.

POLYGRAPH
Associated Research

PORCELAIN, Laboratory
Akatos, Inc.
Coors Porcelain Co.
Fish-Schurmann Co.

POROUS WARE FOR ELECTROLYSIS
Coors Porcelain Co.
Fish-Schurman Co.

POSITION INDICATORS
Automatic Temp. Control
Bailey Meter Co.
Bendix Marine Products
Boston Auto Gage Co.
Builders Iron Foundry
Elec. Indicator Corp.
Electric Speed Ind.
Elec. Tachometer Corp.
Foxboro Co.
General Elec. Co.
Hickok Elec. Inst. Co.
Pioneer Instrument Co.
Shallcross Mfg. Co.
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.

POSITION RECORDERS
Amer. Automatic Electric
Annis Co.
Autocall Co.
Bailey Meter Co.
Builders Iron Foundry
Elec. Indicator Corp.
Elec. Tachometer Corp.
Foxboro Co.
Westinghouse Elec. & Mfg.

POSTS, BINDING (See Connectors)

POTENTIAL DETECTORS (See Detectors, Potential)

POTENTIOMETERS, Automatic Control
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Coleman Elec. Co.
Dickson Co.
Foxboro Co.
Leeds & Northrup Co.

POTENTIOMETERS, Automatic Control (Cont'd)
Lewis Engg. Co.
Mason Neilan Regulator
Spence Engineering Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Weston Elec. Inst. Corp.
Wheelco Inst. Co.

POTENTIOMETERS, Automatic Self Balancing
Bailey Meter Co.
Bristol Co.
Electronic Prod. Co.
Foxboro Co.
Leeds & Northrup Co. (Cont'd)

POTENTIOMETERS Automatic Self Balancing (Continued)
Lewis Engg. Co.
Tagliabue Mfg. Co.
Weston Elec. Inst. Corp.

POTENTIOMETERS, Indicating
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Cambridge Inst. Co.
Dickson Co.
Foxboro Co.
General Elec. Co.
Heilige, Inc.
J-B-T Insts., Inc.
Leeds & Northrup Co.
Lewis Engg. Co.
Remler Co., Ltd.
Rubicon Co.
Tagliabue Mfg. Co.
Thwing-Albert Instrument
Wheelco Inst. Co.
Weston Elec. Inst. Corp.

POTENTIOMETERS, Recording
American Inst. Co.
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Clarostat Mfg. Co.
Foxboro Co.
Leeds & Northrup Co.
Lewis Engg. Co.
Mason Neilan Regulator
Tagliabue Mfg. Co.
Thwing-Albert Instrument
United Cinephone Corp.

POWDERED MATERIALS MEASUREMENTS (See Granular Materials)

POWER FACTOR INDICATORS
Clough-Brengle Co.
Elec. Facilities, Inc.
General Elec. Co.
Hickok Elec. Inst. Co.
Leeds & Northrup Co.
Roller-Smith Co.
Sensitive Research Inst.
Westinghouse Elec. & Mfg.

POWER FACTOR RECORDERS
Elec. Facilities Inc.
Esterline-Angus Co.
General Elec. Co.
Leeds & Northrup Co.
Roller-Smith Co.
Westinghouse Elec. & Mfg.

POWER FACTOR REGULATORS
Allis-Chalmers Mfg.
Leeds & Northrup Co.
Vaughn-G. E. Witt Co.

POWER-LEVEL INDICATORS
Clough-Brengle Co.
General Elec. Co.
General Radio Co.
Hickok Elec. Inst. Co.
Shallcross Mfg. Co.
Sound Apparatus Co.
Westinghouse Elec. & Mfg.

PRECISION-BORE GLASS TUBING
Ace Glass Inc.
Fischer & Porter
Fish-Schurman Co.
Scientific Glass

RUBICON PORTABLE PRECISION POTENTIOMETER

Available in a number of double-range combinations, such as 1 volt and .1 volt, 100 MV and 10 MV, also in pH ranges. Guaranteed accuracy .1%. *An outstanding value.*

Described in Bulletin 270 which also describes *Rubicon* High Precision Type B Laboratory Potentiometer.

We also make galvanometers, electrometers, colorimeters, permeameters, Wheatstone and Kelvin Bridges, Resistance standards, coil testers, acronographs, clip-on transformer ammeters.

Descriptive bulletins available on request.

RUBICON COMPANY
Electrical Instrument Makers
29 North 6th Street Philadelphia, Pa.

Light Beams TO MICROAMPS

Luxtron*
PHOTO ELECTRIC CELLS
BRADLEY LABORATORIES, INC.
82 MEADOW ST. • NEW HAVEN, CONN.

THAT'S the job of Luxtron* Photo-Electric Cells, and with Luxtron* you get more current with less light. That's why Luxtron* Cells are extensively used in commercial photometry equipment and exposure meters — and why they are able to operate relays directly, without booster amplifiers or external voltage supply, in many industrial control applications.

In addition to their remarkable current sensitivity, Luxtron* Cells combine sturdiness with stability, long life with low cost, and are substantially unaffected by temperature change.

Luxtron* Cells are manufactured exclusively by the Bradley Laboratories of ALL AMERICAN components, in a variety of sizes and shapes, mounted or unmounted, and in several different terminal arrangements. Write today for Catalog No. 101, listing the types available and complete technical data.

BRADLEY LABORATORIES, Inc. Dept. IN-1
82 Meadow St., New Haven, Conn.

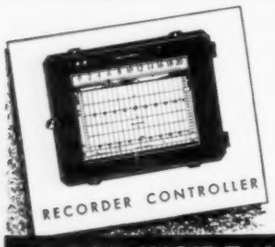
Please rush copy of Cat. No. 101.

NAME.....

ADDRESS.....

CITY..... STATE.....

For addresses, see pages 66-76



TAG CELECTRAY POTENTIOMETERS

Do you want to control your laboratory furnace to 0.1°—0.01°—1 microvolt, or do you want a simple, rugged instrument that requires a minimum of attention for plant use? Then use a CELECTRAY Electrical Thermometer or Potentiometer . . . they alone utilize the high speed combination of photoelectric action—a beam of light, and a mirror galvanometer. Write for Catalog No. 1101-I.

C. J. TAGLIABUE MFG. CO.
Park & Nostrand Avenues, Brooklyn, N. Y.

LOOK INSIDE the COVER (Part 1) For a COMPLETE LIST of TAG INSTRUMENTS TAG

PRESSES, Laboratory
American Inst. Co.
Baldwin-Southwark Corp.
Central Scientific Co.
Elmer & Amend
Hydraulic Press Co.
Microchemical Service
Williams Apparatus

PRESSES, PELLET
Central Scientific Co.
Elmer & Amend
Hannifin Mfg. Co.
Parr Instrument Co.

PRESSURE CONTROLLERS, AUTOMATIC (See Controllers, Automatic, Pressure)

PRESSURE, High (Above 1000 lbs.) Indicators
Abercrombie Pump Co.
Arca Regulators, Inc.
Atlas Valve Co.
Bailey Meter Co.
Baldwin-Southwark Corp.
Brooke Eng. Co.
Brown Inst. Co.
Crosby Steam Gage Co.
Fisher Governor Co.
Foxboro Co.
Heise Bourdon Tube Co.
Kollsman Inst. Co.
Kurman Electric Co.
Linde Air Products Co.
Marsh Corp.
Mason Neilan Regulator
McAlear Mfg. Co.
RCA Manufacturing Co.
Republic Flow Meters
Star Brass Mfg. Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Thrush & Co., H. A.
Trerice Co.

PRESSURE, HIGH (Above 1000 lbs.) Recorders
Bailey Meter Co.
Baldwin-Southwark Corp.
Bristol Co.
Brown Inst. Co.
Cambridge Inst. Co.
Cash Co.
Commercial Engg. Labs.
(Cont'd)

PRESSURE, HIGH, Recorders (Cont'd)
Crosby Steam Gage Co.
Dickson Co.
Esterline-Angus Co.
Foxboro Co.
Hydraulic Press Co.
Kurman Electric Co.
Linde Air Products Co.
Marsh Corp.
Mason-Neilan Regulator
Republic Flow Meters Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Trerice Co.

PRESSURE, HIGH (Above 1000 lbs.) Testing Devices
Bailey Meter Co.
Baldwin-Southwark Corp.
Crosby Steam Gage Co.
Foxboro Co.
Kurman Electric Co.
Parr Instrument Co.
Pioneer Instrument
RCA Manufacturing Co.
Refinery Supply Co.
Walter Ruska & Co., Inc
Star Brass Mfg. Co.

PRESSURE INDICATORS, Bellows
Autocall Co.
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Crosby Steam Gage Co.
Defender Automatic Reg.
Dickson Co.
Mason-Neilan Regulator
Morey & Jones, Ltd.
Pioneer Instrument
Precision Therm. & Inst.
Tagliabue Mfg. Co.
Taylor Inst. Cos.

PRESSURE INDICATORS, Bourdon-tube
Bailey Meter Co.
Baldwin-Southwark Corp.
Bristol Co.
Brown Inst. Co.
Crosby Steam Gage Co.
Dickson Co.
(Cont'd)

PRESSURE INDICATORS, Bourdon-tube (Cont'd)
Foxboro Co.
Heise Bourdon Tube Co.
Hoke, Inc.
Kenyon Instrument Co.
Kollsman Inst. Co.
Marsh Corp., Jas. P.
Mason-Neilan Regulator
Pioneer Instrument
Republic Flow Meters
Star Brass Mfg. Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Trerice Co.

PRESSURE INDICATORS, Diaphragm, etc.
Abercrombie Pump Co.
Bailey Meter Co.
Brown Inst. Co.
Dickson Co.
Foxboro Co.
King-Seeley Corp.
Kollsman Inst. Co.
Marsh Corp., Jas. P.
Mason-Neilan Regulator
Morey & Jones, Ltd.
Pioneer Instrument
Powers Regulator Co.
Rochester Mfg. Co.
Tagliabue Mfg. Co.

PRESSURE INDICATORS, Electrical-resistance
Baldwin-Southwark Corp.
General Elec. Co.
Kurman Electric Co.
Rubicon Co.

PRESSURE INDICATORS, Inverted-bell
Bacharach Indus. Inst.
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Dickson Co.
Foxboro Co.
Mason-Neilan Regulator
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Uehling Inst. Co.

PRESSURE INDICATORS, Membrane
Bailey Meter Co.
(Cont'd)

PRESSURE INDICATORS, Membrane (Cont'd)
Dickson Co.
Mason-Neilan Regulator

PRESSURE INDICATORS, Piezoelectric
Batcher, Ralph R.
Brush Development Co.
Commercial Engg. Labs.
RCA Manufacturing Co.

PRESSURE INDICATORS, Piston, Weight-loaded
American Inst. Co.
Bailey Meter Co.
Hagan Corp.
Pioneer Instrument

PRESSURE INDICATORS, Single-tube, liquid column
Bacharach Indus. Inst.
Detroit Air Meter Co.
Dwyer Mfg. Co.
Gas App. Specialties
Morey & Jones, Ltd.
Pioneer Instrument
Precision Therm. & Inst.
Uehling Instrument Co.

PRESSURE INDICATORS, Spring-loaded piston
Bacharach Indus. Inst.
Commercial Engg. Labs.

PRESSURE INDICATORS, U-tube
Amthor Test. Mach.
Bacharach Indus. Inst.
Bailey Meter Co.
Connelly Iron Sponge
Consol. Ashcroft Hancock
Detroit Air Meter Co.
Dwyer Mfg. Co.
Friez & Sons
Gas App. Specialties
Gotham Inst. Co.
Mason-Neilan Regulator
Meriam Co.
Moeller Instrument Co.
Morey & Jones, Ltd.
Precision Therm. & Inst.
Refinery Supply Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Trerice Co.
Uehling Instrument Co.

PRESSURE RECORDERS, Bellows
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Consol. Ashcroft Hancock
Dickson Co.
Esterline-Angus Co.
Mason-Neilan Regulator
Morey & Jones, Ltd.
Republic Flow Meters
Tagliabue Mfg. Co.
Taylor Inst. Cos.

PRESSURE RECORDERS, Bourdon tube
Bailey Meter Co.
Baldwin-Southwark Corp.
Bristol Co.
Brown Inst. Co.
Consol. Ashcroft Hancock
Dickson Co.
Esterline-Angus Co.
Foxboro Co.
Gotham Inst. Co.
Improved Gauge Mfg. Co.
Kenyon Instrument Co.
Leeds & Northrup Co.
Marsh Corp., Jas. P.
Mason-Neilan Regulator
Morey & Jones, Ltd.
Republic Flow Meters
Star Brass Mfg. Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Thrush & Co., H. A.
Trerice Co.

PRESSURE RECORDERS, Capsular spring
Tagliabue Mfg. Co.

PRESSURE RECORDERS, Diaphragm
Bailey Meter Co.
Brown Inst. Co.
Foxboro Co.
Dickson Co.
Marsh Corp., Jas. P.
Mason-Neilan Regulator
Morey & Jones, Ltd.
Tagliabue Mfg. Co.

PRESSURE RECORDERS, Electrical-resistance
Republic Flow Meters

PRESSURE RECORDERS, Inverted-bell
Bacharach Indus. Inst.
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Dickson Co.
Foxboro Co.
Leeds & Northrup Co.
Mason-Neilan Regulator
Taylor Inst. Cos.
Uehling Instrument Co.

PRESSURE RECORDERS, Membrane
Mason-Neilan Regulator

PRESSURE RECORDERS, Piezoelectric
Brush Development Co.
RCA Manufacturing Co.

PRESSURE RECORDERS, Piston, weight-loaded
Bailey Meter Co.

PRESSURE RECORDERS, Single-tube liquid column
Trerice Co.
Uehling Instrument Co.

PRESSURE RECORDERS, Spring-loaded piston
Bacharach Indus. Inst.
Baldwin-Southwark Corp.
Commercial Engg. Labs.
Esterline-Angus Co.

PRESSURE RECORDER U-tube
Bailey Meter Co.
Brown Inst. Co.
Foxboro Co.
Mason-Neilan Regulat
Republic Flow Meters
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Trerice Co.
Uehling Instrument Co

PRESSURE SNUBBERS
Binkley, G. S.
Brown Inst. Co.
Marsh Corp.
Martin Decker Corp.
McAlear Mfg. Co.
Meriam Co.
National Engg. Prods.

PRISMS
Akatos, Inc.
Alpha Instrument Co.
Bausch & Lomb Opt.
Clark & Sons
Fish-Schurman Co.
Fecker, J. W.
Fuess, Inc.
Gaertner Scientific Cor
Goerz Amer. Optical Co
Jarrell-Ash Co.
Kern Co.
Keuffel & Esser Co.
Kollmorgen Optical Co.
Machlett & Son
Perkin-Elmer Corp.
Rieker Inst. Co.
Spencer Lens Co.
Valpey Crystals
Woermann-Schuchhardt

PROCESS TIMING I STRUMENTS (S Timers, Automatic Pro ess)

PROGRAM CLOCKS (S Timers, Automatic Pro ess)

PROJECTORS, Color Film
Bausch & Lomb Optical
Bell & Howell Co.
Leitz, Inc.
Spencer Lens Co.
Woermann-Schuchhardt

PROJECTORS, Film Sli Lantern Slide & Opag Object
Bausch & Lomb Optical
Leitz, Inc.
Spencer Lens Co.
Woermann-Schuchhardt
Zeiss, Inc.

PROTRACTORS, Bevel (S Drawing Instruments)

PROTRACTORS, Course
Alpha Instrument Co.
Bliss & Co.
Eastern Science Co.
Kenyon Instrument Co
Keuffel & Esser Co.
Marine Compass Co.
Negus, T. S. & J. D.
Pioneer Instrument Co.
Warren-Knight Co.

PROTRACTORS, Navig tors (See Protractor Course)

PROTRACTORS, Transp ent (See Drawing I struments)

PROVERS, Gas Meter
Lambert Meter Co. In
Pittsburgh Equit. Mete

PROVERS, Water Meter
Pittsburgh Equit. Meter

MEASURING AND RECORDING PLASTICITY

THE PLASTOGRAPH

Measures consistency over a wide range of materials—from viscous, syrupy substances to unvulcanized rubber.

For any pliable material where the consistency (plasticity) is of importance, either in the final product or during the production process.

Can be supplied with various types of mixers or agitators—all water jacketed for efficient temperature control.

Has three different sensitivity settings.

Pamphlet on request

Brabender Corporation Rochelle Park, New Jersey

INDUSTRIAL OVENS
FURNACES PYROMETERS
TESTING MACHINES
TEMPERATURE CONTROL EQUIPMENT
SALES SERVICE
and REPAIRS
All Makes and Types of Above
INDUSTRIAL X-RAY SERVICE

CLAUD S. GORDON COMPANY
Cleveland Chicago Indianapolis

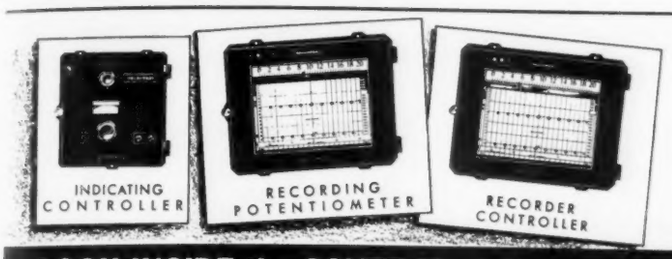
CAMBRIDGE ***SURFACE . . . NEEDLE . . . MOLD*** **PYROMETERS**

CAMBRIDGE COMBINATION PYROMETERS enable accurate temperature checks of material in the mass . . . or of flat and curved surfaces, moving or stationary . . . or of mold cavities. Three thermocouples, quickly interchangeable, give this single instrument many applications. Ranges up to 1200°F. **EXTENSION MODEL SURFACE PYROMETER is indispensable for hard-to-reach places.**

Appliation in RUBBER, PLASTICS, GLASS, POTTERY, METALLURGICAL INDUSTRIES, PAPER MILLS, HAT FACTORIES AND TEXTILE MILLS, STEEL MILLS, NON-FERROUS SHEET MILLS, FOUNDRIES, MACHINE SHOPS, TOOL ROOMS, ELECTRICAL INDUSTRIES, ETC.
Send for Descriptive Literature—Bulletin 194-SI

CAMBRIDGE INSTRUMENT CO., INC. 3732 Grand Central Terminal
Pioneer Manufacturers of Precision Instruments New York, N. Y.

For addresses, see pages 66-76



TAG CELECTRAY PYROMETERS

BETTER TEMPERATURE CONTROL . . .
MORE ACCURATE TEMPERATURE RECORD

The simple, modern design of rugged CELECTRAY Pyrometers offers Industry—
High Sensitivity Control—Accurate and Fast Recording.
Write for Catalog No. 1101-I.

C. J. TAGLIABUE MFG. CO.
Park & Nostrand Avenues, Brooklyn, N. Y.

LOOK INSIDE the COVER (Part 1) *For a* COMPLETE LIST *of* TAG INSTRUMENTS

PROVING RINGS
Baldwin-Southwark Corp.
Morehouse Machine Co.
Olsen Testing Machine
Pittsburgh Inst. & Mach.

PSYCHOLOGY LABORATORY APPARATUS
Batcher, Ralph R.
Brush Development Co.
Electro-Medical Lab.
General Radio Co.
Phipps & Bird, Inc.

PSYCHROMETERS, Aspiration
American Moistening Co.
Brown Inst. Co.
Friez & Sons
Fuess, Inc.
G. M. Mfg. Co., Inc.
H-B Inst. Co., Inc.
Mason-Neilan Regulator
Moeller Instrument Co.
Palmer Co.

PSYCHROMETERS, Atomizing
Parks-Cramer Co.

PSYCHROMETERS, Electric (See Psychrometers, Aspiration)

PSYCHROMETERS, Recording (See Hygrometers, Recording)

PSYCHROMETERS, Sling
Accuracy Scientific Inst.
American Inst. Co.
American Moistening Co.
Central Scientific Co.
(Cont'd)

PSYCHROMETERS, Sling (Continued)
Chicago Apparatus Co.
Foxboro Co.
Fried & Lustig
Friez & Sons
Fuess, Inc.
G. M. Mfg. Co., Inc.
Green, Henry J.
H-B Inst. Co., Inc.
Huddleston, J. S. F.
Johnson Service Co.
Moeller Instrument Co.
Palmer Co.
Parks-Cramer Co.
Phila. Thermometer Co.
Precision Therm. & Inst.
Scientific Inst. Co.
Taylor Inst. Cos.
Trerice Co.
Warren-Knight Co.
Weksler Thermometer

PUBLIC HEALTH TESTING EQUIPMENT
American Inst. Co.
Central Scientific Co.
Chicago Apparatus Co.
Fisher Scientific Co.
Hellige, Inc.
LaMotte Chemical Prod.
Precision Scientific Co.
Rieker Inst. Co.
Rubicon Co.
Scientific Glass App.
Taylor & Co., Inc., W.A.

PULSATION DAMPER (See Pressure Snubber)

PULVERIZED MATERIALS MEASUREMENTS (See Granular Materials)

PUMPS, High Vacuum
Central Scientific Co.
Chicago Apparatus Co.
Distillation Prods., Inc.
Machlett & Son
Nelson, George F.
Refinery Supply Co.
Scientific Glass App.
Sterling Eng. Co.
Welch Mfg. Co.

PYCNOMETERS
Elmer & Amend
Fisher Scientific Co.
G. M. Mfg. Co.
Rascher & Betzold
Specialty Glass Co.

PYRHELIOMETERS
Cambridge Inst. Co.
Eppley Lab.
Leeds & Northrup Co.

PYROMETER CALIBRATING SETS
Brown Inst. Co.
Cambridge Inst. Co.
Foxboro Co.
Leeds & Northrup Co.
Lewis Engineering
Rubicon Co.
Tagliabue Mfg. Co.
Thwing-Albert Inst. Co.

PYROMETERS, Electrical Resistance
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Cambridge Inst. Co.
Dickson Co.
Foxboro Co.
(Cont'd)

PYROMETERS, Electrical Resistance (Cont'd)
General Elec. Co.
Ill. Testing Labs.
J-B-T Insts., Inc.
Leeds & Northrup Co.
Lewis Engg. Co.
Roller-Smith Co.
Rubicon Co.
Tagliabue Mfg. Co.
Thwing-Albert Inst. Co.
Wheelco Inst. Co.

PYROMETERS, Expansion
Defender Automatic Reg.
Ferner Co.
Partlow Corp.
Tagliabue Mfg. Co.

PYROMETERS, Indicating
Bacharach Indus. Inst.
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Burling Inst. Co.
Electronic Prod. Co.
Elematic Mfg. Co.
Engelhard, Chas.
Foxboro Co.
Ill. Testing Labs.
Leeds & Northrup Co.
Lewis Engg. Co.
Partlow Corp.
Pyrometer Inst. Co.
Roller-Smith Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Thwing-Albert Instrument
Wheelco Inst. Co.

PYROMETERS, Millivoltmetric
Am. Gas Furnace Co.
Bristol Co.
Brown Inst. Co.
Cambridge Inst. Co.
De Jur-Amsco Corp.
Elematic Mfg. Co.
Engelhard, Chas.
Foxboro Co.
Hoskins Mfg. Co.
Ill. Testing Labs.
Pyrometer Instrument Co.
Rubicon Co.
Taylor Inst. Cos.
Thwing-Albert Instrument
Wheelco Inst. Co.

PYROMETERS, Optical
Bacharach Indus. Inst.
Brown Inst. Co.
Burrell Technical Supply
Cambridge Inst. Co.
Fisher Scientific Co.
Leeds & Northrup Co.
Pyrometer Instrument Co.

PYROMETERS, Portable
Bacharach Indus. Inst.
Bristol Co.
Brown Inst. Co.
Burrell Technical Supply
Cambridge Inst. Co.
Elematic Mfg. Co.
Engelhard, Chas.
Foxboro Co.
Hoskins Mfg. Co.
Ill. Testing Labs.
J-B-T Instruments
Leeds & Northrup Co.
Lewis Engg. Co.
(Cont'd)

PYROMETERS, PORTABLE (Continued)
Pyrometer Instrument Co.
Rubicon Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Thwing-Albert Instrument
Wheelco Inst. Co.

PYROMETERS, Potentiometric
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Cambridge Inst. Co.
Dickson Co.
Foxboro Co.
J-B-T Insts., Inc.
Leeds & Northrup Co.
Lewis Engg. Co.
Rubicon Co.
Tagliabue Mfg. Co.
Thwing-Albert Instrument
Wheelco Inst. Co.

PYROMETERS, Radiation, Controlling
Am. Gas Furnace Co.
Bacharach Indust. Inst.
Bailey Meter Co.
Brown Inst. Co.
Cambridge Inst. Co.
Engelhard, Chas.
Foxboro Co.
General Elec. Co.
Ill. Testing Labs.
Leeds & Northrup Co.
Tagliabue Mfg. Co.
Thwing-Albert Instrument
Wheelco Inst. Co.

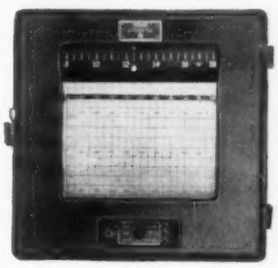
J-B-T INDICATING PYROMETERS

- RUGGED, ACCURATE
- MANY SIZES, RANGES, INCLUDING 3" PANEL
- THERMOELECTRIC, OR POTENTIOMETRIC; ALSO RESISTANCE TYPE

Model 70-PO potentiometer-pyrometer (portable model illustrated—also wall mounted) combines potentiometer accuracy with ease of reading deflection instrument. Eliminates balancing, is read faster. Write for literature, suggesting application.

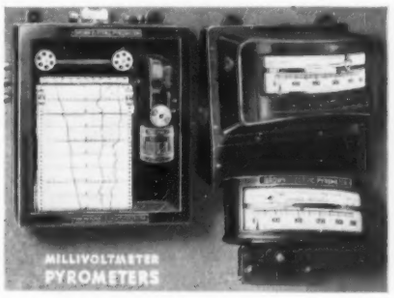
J-B-T INSTRUMENTS, Inc.
441-G CHAPEL ST. NEW HAVEN, CONN.

FOXBORO PYROMETERS



The Foxboro Pyrometer line embraces a variety of types including Indicators, Controllers and Recorder Controllers. Single and multiple recording instruments up to eight records on one chart are available. The Recorder-Controller is made in several types, both air- and electrically-operated, to fill practically every conceivable need.

For complete information write for Bulletin No. 190-4. **The Foxboro Company, 46 Neponset Avenue, Foxboro, Massachusetts, U. S. A.** Branch offices in principal cities of the United States and Canada.



For Controlling, Recording and Indicating Temperatures from 0 to 3000°F.

A direct-reading, simple and sturdy pyrometer, especially suited for industrial applications where simplicity and ruggedness are of greater importance than extreme accuracy. The instrument can be calibrated to compensate for long lengths of extension lead wire between thermocouples and instrument. No dry cells or standard cells required.

Charts and scales for a wide variety of ranges are available, from a minimum temperature span of 800°F. to a maximum span of 3000°F. Corresponding Centigrade scales and charts are also available.

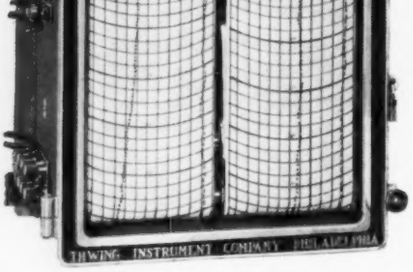
Pyrometer accessories, such as thermocouples and extension lead wire, furnished with instruments to meet the requirements of each job.

Write for Catalog 15-E, THE BROWN INSTRUMENT COMPANY, *a division of Minneapolis-Honeywell Regulator Co.*, 4482 Wayne Avenue, Philadelphia, Pa.

BROWN PYROMETERS
AND
MINNEAPOLIS-HONEYWELL CONTROL SYSTEMS
To Measure and Control is to Economize

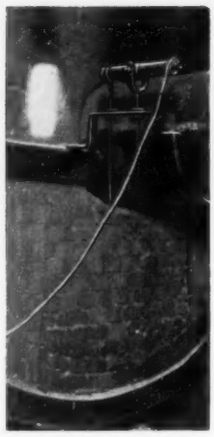
For addresses, see pages 66-76

THWING-ALBERT Plant

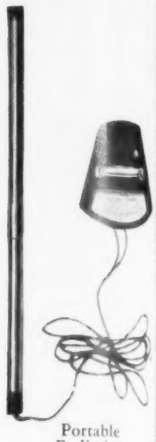


Multiple Recording Pyrometer

Indicating Pyrometer combined with Selector Switch



Radiation Pyrometer for Rotary Kiln



Portable Radiation Pyrometer

Treasure Chest Potentiometer.

Pyrometer and Thermocouple Testing Set.

A5X Pyrometer for molten non-ferrous metals

TEMPERATURE MEASURING, CONTROL AND TESTING INSTRUMENTS

RECORDING PYROMETERS: Single record and multiple recording types. Continuous roll charts. Automatic chart re-roll. Patented dot and dash system of recording. Synchronous electric motor drive. Metal case construction. Accurate, simplified and rugged.

Furnished for use with either base metal or platinum thermocouples, radiation pyrometer receiving tubes or electrical resistance thermometer bulbs.

INDICATING PYROMETERS: Single indicating type or multiple point indicating type. Model 30 Pyrometer, illustrated, unit construction. Indicating Pyrometer and selector switch contained in a single moisture, fume and dust-proof metal case. Furnished with switch capacities 4, 6, 8, 12, 16, 24 and 32 points and off position. Suitable especially for diesel engine service, ceramic plants, etc.

RADIATION PYROMETERS: For indicating and recording all high temperatures. No part of pyrometer installed in the heat source. Accurate to the highest temperatures. Radiation receiving tubes are designed and manufactured for permanent installation. Suitable especially for the lime, cement, refractories, glass and steel industries. Portable radiation pyrometer applicable for various service. Temperature readings in 15 seconds.

FOUNDRY PYROMETERS: For non-ferrous metals; A5X Pyrometer with extensible magazine thermocouple. Junctions made by twisting wires together tightly. Temperature readings in 8 seconds.

For ferrous metals; A5F Pyrometer with protected, replaceable thermocouple. Temperature readings in one minute.

PYROMETER TESTING SET: Treasure Chest, a two point portable potentiometer and a pyrometer and thermocouple testing set combined in the one instrument.

Self checking with Electrocrit checking circuit. Range 101 millivolts. Accuracy 1/10 of one percent. Checks all types and all makes of pyrometers and thermocouples.

THERMOCOUPLES: Base Metal and Noble Metal (Platinum, platinum-rhodium).

Furnished with protection tubes to suit individual installation conditions.

AUTOMATIC TEMPERATURE CONTROLLER: Controls automatically and accurately industrial temperature processes. Furnished for operation in conjunction with recording and indicating pyrometers. Applicable to oil, gas and electrically heated furnaces.

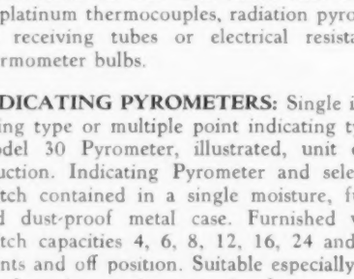
PORTABLE pH METERS: Range 0 to 14 pH. Direct reading in pH units.

Model 1 — Simple potentiometric circuit using quinhydrone or antimony electrodes.

Model 2 — Vacuum tube potentiometric circuit using glass electrodes and/or quinhydrone and antimony electrodes.

Model 3—Standard cell balance, slide wire type. Vacuum tube, continuous deflection potentiometric circuit. Can be used with every type of electrode. Direct reading in millivolts and pH units.

Automatic Temperature Controller



Portable pH Meter

Thwing-Albert

Manufacturers of Scientific

3323 LANCASTER AVE.

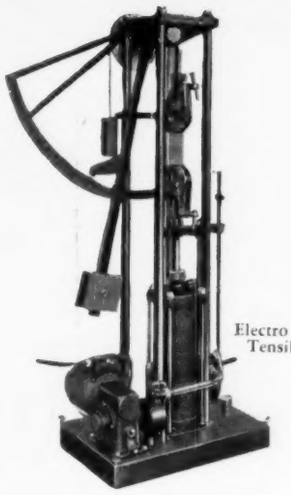
Commercial In...

Catalogs Available on Complete...

Laboratory Instruments

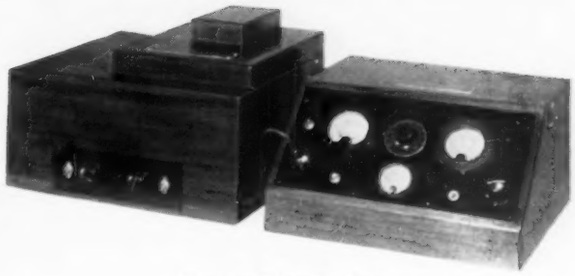
Portable Radiation Pyrometer

Platinum Thermo-couple

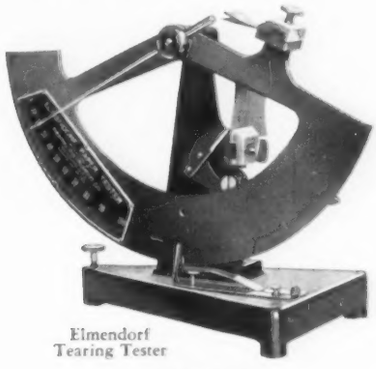


Electro Hydraulic Tensile Tester

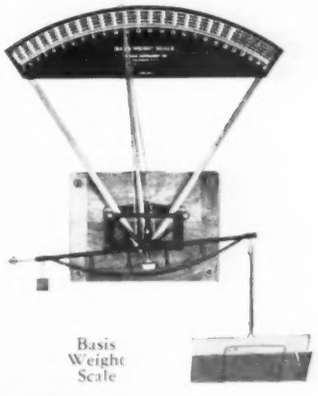
Research Tearing Tester



Formation Tester for Paper



Elmendorf Tearing Tester



Basis Weight Scale

Stiffness-Softness Tester for Paper

ELECTRO-HYDRAULIC TENSILE TESTER: For testing paper, textiles, fine wire, single thread, skein yarn, card board, ply wood, etc. Tensile and elongation tests made to conform with A.S.T.M. and T.A.P.P.I. official testing methods. Operated by electro-hydraulic power. Completely self-contained. Can be furnished with graphic recording device to record tensile stress and elongation of individual specimens.

PAPER TESTING INSTRUMENTS.

ELMENDORF TEARING TESTER: Determines tearing strength of paper and allied products, textile fabrics, cinema film, etc. Operates by gravity. Gives readings in force grams required to tear materials. Standard tearing tester of paper industry.

Two in One Feature: Augmenting Attachment available that doubles capacity of Elmendorf Tester and makes two instruments in one. Permits testing heavy grade papers, felts, etc.

RESEARCH TEARING TESTER: For research and exploratory testing of materials where sensitivity desired is finer than calibration of the standard Elmendorf Tearing Tester.

INITIAL TEAR TESTER (not illustrated): Measures the initial force required to start a tear. Direct reading, resistance to beginning of tear is indicated in force pounds. Especially suitable for testing box board, roofing felts, floor coverings, gasket papers, etc.

BASIS WEIGHT SCALES: Aristocrat Model and Desk Type.

Basis Weight Scales read directly weight per ream of paper by weighing a single sheet. Furnished with ranges to suit individual requirements. Useable for moisture content determinations.

BOX BOARD SCALES: A combination basis weight and sheet counting scale. Indicates on a single dial weight per ream and sheets per bundle.

PENETRATION TESTER: The Penescope provides visual method of testing papers and other materials for permeability to solutions.

Also, Water Jacketed Penescope with equipment to make penetration tests under controlled temperature conditions.

VAPOR TRANSMISSION TESTER: The Vapometer, a simple convenient instrument for testing the vapor transmission properties of paper.

STIFFNESS-SOFTNESS TESTER: Determines stiffness or softness properties by the flexibility of paper in a predetermined angle of rotation.

Research Tester has rollers to adjust length of specimen.

Routine Tester has snap clamp for tests on specimens of known length.

FORMATION TESTER: Measures objectively the property of paper known as Formation. Test specimen in scanning mechanism is moved at high velocity between photo electric cell and light source.

Variations in paper structure (formation) determined electrically. Reading on meter gives formation number. Constructed ruggedly. Simple to operate.

Desk Type Basis Weight Scale

Penescope

Vapometer

lbe strument Co.
of Sci ruments for 39 Years
VE. PHILADELPHIA, U. S. A.
Commercial l tory Accuracy
on Comple and Paper Testing Instruments

PYRO THE SIMPLIFIED OPTICAL PYROMETER

YOU cannot afford NOT to own one!

Because it eliminates guesswork, waste and spoilage; it pays for itself quickly. PYRO is a **SELF-CONTAINED DIRECT - READING, STURDY** unit made to stand rough use but it is absolutely accurate and dependable.

Unique construction enables operator to rapidly determine temperature even on minute spots, fast moving objects or the smallest streams; no correction charts, no accessories, no upkeep.

Stock Ranges: 1400° to 5500° F.

PYRO RADIATION PYROMETER

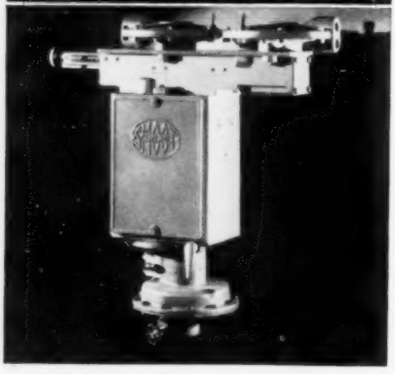
Ideal for furnace or kiln use. Gives actual heat of material

aside from furnace or kiln temperature. Does not require skilled operator. Stock ranges 1000° to 3600° F.

Write for special bulletins

THE PYROMETER INSTRUMENT CO.
103 107 LAFAYETTE ST., NEW YORK, N. Y.
311 ROSS ST., PITTSBURGH, PA.

REGULATORS



Republic-Smoot regulators are supplied for the automatic control of pressure, rate of flow, speed of rotation, level of a liquid or the proportioning of two pressures, flows, etc., in a fixed ratio by mechanically operating a valve, damper, rheostat or various types of variable speed transmissions.

Republic-Smoot regulators may be either oil or air operated. Their extreme flexibility in application and the degree to which they meet the four requirements of sensitivity, power, speed and stability, had been responsible to a large degree for the outstanding success of Republic-Smoot control systems.

WRITE FOR DATA BOOK No. S-13

REPUBLIC FLOW METERS CO.
2249 DIVERSEY PKWY., CHICAGO, ILLINOIS

PYROMETERS, Radiation, Indicating
Bachrach Industrial Inst.
Bristol Co.
Brown Inst. Co.
Cambridge Inst. Co.
General Elec. Co.
Leeds & Northrup Co.
Pyrometer Instrument Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Thwing-Albert Instrument
Wheelco Inst. Co.

PYROMETERS, Radiation, Recording
Bachrach Industrial Inst.
Bristol Co.
Brown Inst. Co.
Cambridge Inst. Co.
General Elec. Co.
Leeds & Northrup Co.
Pyrometer Instrument Co.
Tagliabue Mfg. Co.
Thwing-Albert Instrument

PYROMETERS, Thermoelectric, Immersion
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Cambridge Inst. Co.
Elematic Mfg. Co.
General Elec. Co.
Ill. Testing Labs.
J-B-T Instruments, Inc.
Leeds & Northrup Co.
Lewis Engg. Co.
Partlow Corp.
Pyrometer Inst. Co.
Roller-Smith Co.
Tagliabue Mfg. Co.
Thwing-Albert Instrument
Woermann-Schuchhardt

PYROMETERS, Thermoelectric, Indicating
Am. Gas Furnace Co.
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Cambridge Inst. Co.
De Jur-Amsco Corp.
Elematic Mfg. Co.
Foxboro Co.
Hebler Co.
Hoskins Mfg. Co.
Ill. Testing Labs.
J-B-T Instruments, Inc.
Leeds & Northrup Co.
Lewis Engg. Co.
Partlow Corp.
Pyrometer Instrument Co.
Roller-Smith Co.
Rubicon Co.
Scientific Inst. Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Thwing-Albert Instrument
Western Instrument Co.
Wheelco Inst. Co.

PYROMETERS, Thermoelectric, Recording & Controlling
Bacharach Indust. Inst.
Bailey Meter Co.
Beck Co.
Bristol Co.
Brown Inst. Co.
Cambridge Inst. Co.
Engelhard, Chas.
Foxboro Co.
General Elec. Co.
Ill. Testing Labs.
Leeds & Northrup
Lewis Engg. Co.
Mason-Neilan Regulator
Partlow Corp.
Pyrometer Instrument Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Thwing-Albert Instrument

PYROMETERS, Thermoelectric, Surface Contact
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Cambridge Inst. Co.
Elematic Mfg. Co.
Foxboro Co.
General Elec. Co.
Ill. Testing Labs.
J-B-T Instruments
Lewis Engg. Co.
Pyrometer Instrument Co.
Tagliabue Mfg. Co.
Thwing-Albert Instrument

PYROMETRIC CONES (See Cones, Pyrometric)

QUARTZ, Fused Quartz Apparatus
Hanovia Chem. & Mfg.
Thermal Syndicate Ltd.

RACKS, STEEL, For Capacitors, Resistors, Transformers, etc.
Falstrom Co.

RADIO BEACON SYNCHRONIZING CONTROLLERS
Andrew, Victor J.
United Cinephone Corp.
Wallace & Tiernan

RADIO FREQUENCY METERS
Andrew, Victor J.
Clough-Brengle Co.
Ferris Inst. Corp.
General Elec. Co.
Hickok Elec. Inst. Co.
Lampkin Laboratories
Measurement Corp.
(Cont'd)

RADIO FREQUENCY METERS (Cont'd)
Millen Mfg. Co.
Rawson Electrical Inst.
RCA Manufacturing Co.
Roller-Smith Co.
Sensitive Research Inst.
Simpson Elec. Co.
Triplett Electrical Inst.
Weston Elec. Inst. Corp.

RADIO FREQUENCY OSCILLATORS (See Oscillators, Radio Frequency)

RADIO-MICROMETERS (See Micrometers, Radio)

RADIO REMOTE CONTROL SYSTEMS
American Automatic Elec.
McFarlin Co.
Pioneer Instrument
RCA Manufacturing Co.
United Cinephone Corp.
Wallace & Tiernan

RADIO SET ANALYZERS (See Analyzers, Radio Set)

RADIO TEST PANELS (See Panels, Radio Test)

RADIO TUBE CHECKERS (See Checkers, Radio Tube)

RAIN GAGES
Ballauf Mfg. Co.
Central Scientific Co.
Friez & Sons
Fuess, Inc.
Green, Henry J.
Gurley, W. & L. E.
Keuffel & Esser Co.
Leupold, Volpel & Co.
Precision Therm. & Inst.
Taylor Inst. Cos.
Warren-Knight Co.
White Co., Inc.

RAINFALL RECORDERS
Esterline-Angus Co.
Friez & Sons
Fuess, Inc.
Green, Henry J.
Leupold, Volpel & Co.
Taylor Inst. Cos.

RANGE FINDING INSTRUMENTS
Fecker, J. W.
Gaertner Scientific Corp.
Kern Co.
Keuffel & Esser Co.
Kollmorgen Optical Co.
Leitz, Inc.
Precision Therm. & Inst.
White Co., Inc.

RANGE POLES (See Surveying Instruments)

REACTANCE METERS
Andrew, Victor J.
General Radio Co.
Premier Crystal Labs.
Rubicon Co.

READING LENSES, Thermometer & Burette (See Lenses, Reading)

RECORDERS (See object of measurement and control)

RECORDERS, SOUND
Miles Reproducer Co.

RECTIFIERS, Dry Disc
Am. Automatic Electric
Benwood Linze Co.
Elec. Facilities, Inc.
General Elec. Co.
Mellaphone Corp.
Raytheon Mfg. Co.
Standard Elec. Time
United Transformer Corp.

RECTIFIERS, Power
Allis-Chalmers Mfg.
Applied Research Labs.
Eclipse Aviation
Elec. Facilities, Inc.
Electro Products Labs.
General Elec. Co.
Mellaphone Corp.
Raytheon Mfg. Co.
United Transformer Corp.

RECTIFIERS, Thermionic
American Automatic Elec.
Andrew, Victor J.
Continental Elec. Co.
DuMont Labs., Inc., A.B.
Electro Products Labs.
Electrons, Inc.
General Elec. Co.
Hy-Ef Elec. Products
Jones-Orme Co.
Mellaphone Corp.
Raytheon Mfg. Co.
RCA Manufacturing Co.
United Cinephone Corp.
United Transformer Corp.

REDUCING MOTIONS, ENGINE INDICATOR
Bacharach Indust. Inst.
Crosby Steam Gage Co.
Robertson, 3rd, J. L.
Trill Indicator Co.

REFLECTIONMETERS
Akatos, Inc.
Luxtrol Co., Inc.
Pfaltz & Bauer, Inc.
Woermann-Schuchhardt

REFLECTOMETERS
Akatos, Inc.
American Inst. Co.
Higgins, Charles F.
Leeds & Northrup Co.
Woermann-Schuchhardt

REFLECTORS, Aspheric
Am. Telescope Labs.
Baird Associates
Bausch & Lomb Optical
Fecker, J. W.
Fish-Schurman Co.
Fuess, Inc.
Perkin-Elmer Corp.

REFLECTORS, Concave
Am. Telescope Labs.
Baird Associates
Bausch & Lomb Optical
Clark & Sons
Fecker, J. W.
Fish-Schurman Co.
Fuess, Inc.
Perkin-Elmer Corp.
Tinsley Labs.

REFLECTORS, First Surface
Am. Telescope Labs.
Baird Associates
Bausch & Lomb Optical
Clark & Sons
Fecker, J. W.
Fish-Schurman Co.
Fuess, Inc.
Perkin-Elmer Corp.
Tinsley Labs.

REFLECTORS, Heat Resisting
Am. Telescope Labs.
Bausch & Lomb Optical
Fish-Schurman Co.
Fuess, Inc.
Perkin-Elmer Corp.

REFLECTORS, Parabolic
Am. Telescope Labs.
Baird Associates
Bausch & Lomb Optical
Clark & Sons
Fecker, J. W.
Fish-Schurman Co.
Fuess, Inc.
Perkin-Elmer Corp.
Tinsley Labs.
Weber Bros. Metal Works

REFLECTORS, Spherical
Am. Telescope Labs.
Baird Associates
Bausch & Lomb Optical
Clark & Sons
Fecker, J. W.
Fish-Schurman Co.
Fuess, Inc.
Perkin-Elmer Corp.
Tinsley Labs.

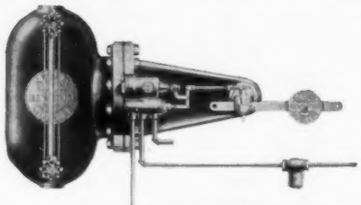
REFLECTORS, Stellite
American Telescope Labs.
Bausch & Lomb Optical
Fecker, J. W.
Kollmorgen Optical Co.
Perkin-Elmer Corp.

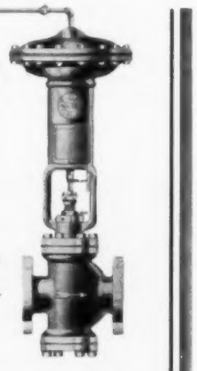
Kieley & Mueller PRODUCTS

62nd YEAR

A complete range of sizes and types in

Valves
Regulators
Liquid Level Controls
Strainers
Steam Traps
and
Engineering Specialties





Custom Sub-assemblies for all Valve Requirements

KIELEY & MUELLER, INC.
General Offices—40 West 13th St., N. Y. C.
Factory at Newark, N. J.

YOUR CONTROL ENGINEERS

For addresses, see pages 66-76

REFRACTOMETERS
Akatos, Inc.
Bausch & Lomb Optical
Central Scientific Co.
Fuess, Inc.
Industro-Scientific Co.
Jarrell-Ash Co.
Ruska & Co.
Spencer Lens Co.
Zeiss, Inc., Carl

REFRACTORY TUBES
Coors Porcelain Co.

REGULATORS, AUTOMATIC (See also Controls, Automatic; and object of measurement and control)

REGULATORS, AUTOMATIC, Air
Acme Regulator Co.
American Meter Co.
Arca Regulators, Inc.
Askania Regulator Co.
Bailey Meter Co.
Bastian-Blessing Co.
Boekel & Co.
Boylston Co.
Bristol Co.
Brooke Eng. Co.
Brown Inst. Co.
Cash Co.
Connelly Iron Sponge
Consol. Ashcroft Hancock
Cutler-Hammer, Inc.
Davis Reg. Co.
D'Este Co.
Detroit Lubricator
Dockson Co.
Fisher Governor Co.
Foster Engg. Co.
Foxboro Co.
Friez & Sons
Gas Appliance Specialties
General Regulator Corp.
Hagan Corp.
Hanlon-Waters, Inc.
Hoke, Inc.
Johnson Service Co.
Judson Governor Co.
Kiely & Mueller
Lammert & Mann Co.
Leslie Co.
Linde Air Products Co.
Mason Neilan Regulator
McAlear Mfg. Co.
McCorkle Co.
Mercon Regulator Co.
National Airoil Burner
Natural Gas Equipment
Northern Equip. Co.
Parks-Cramer Co.
Partlow Corp.
Payne Furnace & Supply
Penn Electric Switch Co.
Pgh. Equitable Meter
Powers Regulator Co.
Preferred Utilities Mfg.
Republic Flow Meters
Reynolds Gas Regulator
Robertshaw Thermostat
Ruggles-Klingemann
Schade Valve Mfg.
Sprague Meter Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
United Cinephone Corp.
Vaughn-G.E. Witt Co.
Victor Equipment Co.
Watts Regulator Co.
White-Rodgers Electric
Wilgus Mfg. Co.

REGULATORS, AUTOMATIC, Atmospheric
Foxboro Co.
Mason-Neilan Regulator
Parks-Cramer Co.
Powers Regulator Co.
Robertshaw Thermostat

REGULATORS, AUTOMATIC, Boiler
Askania Regulator Co.
Bailey Meter Co.
Brooke Eng. Co.
Brown Inst. Co.
Cash Co.
Connelly Iron Sponge
Fisher Governor Co.
Foster Engg. Co.
Foxboro Co.
General Regulator Corp.
Hagan Corp.
Hays Corp.
Hanlon-Waters, Inc.
Mason-Neilan Regulator
McAlear Mfg. Co.
McDonnell & Miller
Minneapolis-Honeywell
National Brass Co.
Natural Gas Equipment
Penn Electric Switch
Perfex Corp.
Republic Flow Meters
Robertshaw Thermostat
Ruggles-Klingemann
Tagliabue Mfg. Co.
Wilcus Mfg. Co.

(Continued on page 34)

REGULATORS, AUTOMATIC, Compressed Gas
American Meter Co.
Bailey Meter Co.
Brooke Eng. Co.
Brown Inst. Co.
Cash Co.
Dockson Co.
Electrimatic Corp.
Fisher Governor Co.
Frick Co.
Hanlon-Waters, Inc.
Hoke, Inc.
(Cont'd)

REGULATORS, AUTOMATIC, Compressed Gas (Continued)
Mason-Neilan Regulator
McAlear Mfg. Co.
Mercon Regulator Co.
Natural Gas Equipment
Pgh. Equitable Meter
Republic Flow Meters
Reynolds Gas Regulator
Robertshaw Thermostat
Tagliabue Mfg. Co.
Victor Equipment Co.

REGULATORS, AUTOMATIC, Condensation (See Controllers, Automatic, Condensation)

REGULATORS, AUTOMATIC, Consistency (Paper & Pulp) (See Controllers, Automatic, Consistency)

REGULATORS, AUTOMATIC, Current
Allis-Chalmers Mfg. Co.
Amperite Corp.
Beck Bros.
Betts & Betts
Burlington Inst. Corp.
Cutler-Hammer, Inc.
General Elec. Co.
Monitor Controller Co.
Robertshaw Thermostat
Roller-Smith Co.

REGULATORS, AUTOMATIC, Damper (See Controllers, Automatic, Damper)

REGULATORS, AUTOMATIC, District (See Governors, District)

REGULATORS, AUTOMATIC, Draft (See Controllers, Automatic, Draft)

REGULATORS, AUTOMATIC, Drying Chamber
Powers Regulator Co.
United Cinephone Corp.

REGULATORS, AUTOMATIC, Feed Water
Askania Regulator Co.
Atlas Valve Co.
Bailey Meter Co.
Brown Inst. Co.
Cochrane Corp.
Davis Reg. Co.
Defender Automatic Reg.
General Regulator Corp.
Hagan Corp.
Hanlon-Waters, Inc.
Mason-Neilan Regulator
McAlear Mfg. Co.
McDonnell & Miller
Mercon Regulator Co.
Minneapolis-Honeywell
Natural Gas Equipment
Northern Equip. Co.
Ruggles-Klingemann
Stets Co.
Tagliabue Mfg. Co.
Vaughn-G. E. Witt Co.
Watts Regulator Co.
Wilgus Mfg. Co.
Williams Gauge Co.

REGULATORS, AUTOMATIC, Flow (See Controllers, Automatic, Flow)

REGULATORS, AUTOMATIC, Flow Proportioning (See Controllers, Automatic, Flow Proportioning)

REGULATORS, AUTOMATIC, Fluid Proportioning (See Controllers, Automatic, Fluid Proportioning)

REGULATORS, AUTOMATIC, Frequency
Burlington Inst. Corp.
General Elec. Co.
Warren Telechron Co.
Wheelco Inst. Co.

REGULATORS, AUTOMATIC, Furnace (See Controllers, Automatic, Furnace)

REGULATORS, AUTOMATIC, Gas (See Regulators, Automatic, Air)

REGULATORS, AUTOMATIC, Humidity (See Controllers, Automatic, Humidity)

REGULATORS, AUTOMATIC, Liquid Level (See Controllers, Automatic, Liquid Level)

REGULATORS, AUTOMATIC, Load
Allis-Chalmers Mfg. Co.
Autom'c Valve Controller
Hays Corp.
Leeds & Northrup Co.
Taylor Inst. Cos.

REGULATORS, AUTOMATIC, Oil Feed
Askania Regulator Co.
Atlas Valve Co.
Brown Inst. Co.
Cash Co.
D'Este Co.
Fisher Governor
Foster Engg. Co.
General Regulator Corp.
Hagan Corp.
(Cont'd)

REGULATORS, AUTOMATIC, Oil Feed (Continued)
Lammert & Mann Co.
Mason-Neilan Regulator
McAlear Mfg. Co.
McCorkle Co.
National Airoil Burner
Republic Flow Meters
Spence Engineering Co.
Taylor Inst. Cos.
United Cinephone Corp.
Vaughn-G. E. Witt Co.
Wilgus Manufacturing

REGULATORS, AUTOMATIC, Power Factor
Allis-Chalmers Mfg. Co.
Leeds & Northrup Co.
United Cinephone Corp.

REGULATORS, AUTOMATIC, Pressure (See Controllers, Automatic, Pressure)

REGULATORS, AUTOMATIC, Pump
Allen-Bradley Co.
Arca Regulators, Inc.
Askania Regulator Co.
Atlas Valve Co.
Bailey Meter Co.
Belfield Co.
Boylston Co.
Brown Inst. Co.
Builders Iron Foundry
Cash Co.
Davis Reg. Co.
D'Este Co.
Fisher Governor Co.
Ford Reg. Valve Co.
Foster Engg. Co.
Furnas Electric Co.
General Regulator Corp.
Hagan Corp.
Hanlon-Waters, Inc.
Hydraulic Press Co.
Klipfel Mfg. Co.
Leslie Co.
Mason-Neilan Regulator
McAlear Mfg. Co.
Mercon Regulator Co.
Northern Equip. Co.
Penn Electric Switch
Republic Flow Meters
Water Level Controls Co.
Schade Valve Mfg. Co.
Spence Engineering Co.
Tagliabue Mfg. Co.
Vaughn-G. E. Witt Co.
Watts Regulator Co.
Wilgus Mfg. Co.

REGULATORS, AUTOMATIC, Refrigeration (See Controllers, Automatic, Refrigeration)

REGULATORS, AUTOMATIC, RKVA
Allis-Chalmers Mfg. Co.

REGULATORS, AUTOMATIC, Safety Fuel Shut-Off (See Valves, Automatic, Safety Fuel Shut-Off)

REGULATORS, AUTOMATIC, Speed (See Controllers, Automatic, Speed)

REGULATORS, AUTOMATIC, Steam (See Regulators, Automatic, Pressure)

REGULATORS, AUTOMATIC, Steam Pressure (See Regulators, Automatic, Pressure)

REGULATORS, AUTOMATIC, Synchronizing
Allis-Chalmers Mfg. Co.
Industrial Engr. Corp.
Magnetic Gauge Co.

REGULATORS, AUTOMATIC, Temperature (See Controllers, Automatic, Temperature)

REGULATORS, AUTOMATIC, Time (See Controllers, Automatic, Time)

REGULATORS, AUTOMATIC, Vacuum (See Controllers, Automatic, Vacuum)

REGULATORS, AUTOMATIC, Viscosity (See Controllers, Automatic, Viscosity)

REGULATORS, AUTOMATIC, Voltage
Allis-Chalmers Mfg. Co.
American Transformer
Amperite Corp.
Burlington Inst. Corp.
Clarostat Mfg. Co.
Eclipse Aviation
Electronic Prod. Co.
Ferris Inst. Corp.
Fredericks, George
General Elec. Co.
Ideal Commuto'r Dresser
International Resistance
Jones-Orme Co.
Luxtrol Co., Inc.
Miller Co., Bertrand F.
Raytheon Mfg. Co.
Roller-Smith Co.
Sola Electric Co.
United Cinephone Corp.
United Transformer Corp.
Ward Leonard Elec. Co.

REGULATORS, AUTOMATIC, Water Pressure (See Regulators, Automatic, Pressure)

REGULATORS, AUTOMATIC, Welding, Gas
Bastian-Blessing Co.
Dockson Co.
Victor Equipment Co.

REGULATORS, MANUAL (Non-Automatic)
Allen-Bradley Co.
Bailey Meter Co.
Beck Bros.
Belfield Co.
Brown Inst. Co.
Cutler-Hammer, Inc.
Fisher Governor
Hanlon-Waters, Inc.
McAlear Mfg. Co.
National Airoil Burner
National Elec. Controller
Pioneer Instrument
Standard Elec. Prods.
Superior Electric Co.
Tagliabue Mfg. Co.
United Transformer Corp.
Ward Leonard Elec. Co.

RELAYS, Automatic
Allen-Bradley Co.
American Inst. Co.
American Automatic Elec.
Autocall Co.
Clare & Co.
Cutler-Hammer, Inc.
Eclipse Aviation
General Controls Co.
General Elec. Co.
Guardian Elec. Mfg. Co.
Hagan Corp.
Industrial Eng. Corp.
Kellogg Switchboard
Mercoid Corp.
Minneapolis-Honeywell
Monitor Controller Co.
Paragon Electric Co.
Penn Electric Switch
Perfex Corp.
Struthers-Dunn
Ward Leonard Elec. Co.
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.

RELAYS, Capacity-Operated
Electronic Lab.
Luxtrol Co., Inc.

RELAYS, Circuit Control
Advance Electric Co.
Allen-Bradley Co.
American Automatic Elec.
American Inst. Co.
Autocall Co.
Automatic Switch Co.
Brown Inst. Co.
Clare & Co.
Electric Controller
Friez & Sons
General Elec. Co.
Guardian Elec. Mfg. Co.
H-B Inst. Co., Inc.
Kellogg Switchboard
Leach Relay Co.
Lumenite Elec. Co.
Miller Co., Bertrand F.
Minneapolis-Honeywell
Monitor Controller Co.
Paragon Electric Co.
Sigma Instruments, Inc.
Standard Elec. Prods.
Struthers-Dunn
United Cinephone Corp.
Ward Leonard Elec. Co.
Western Electro-Mech.
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.

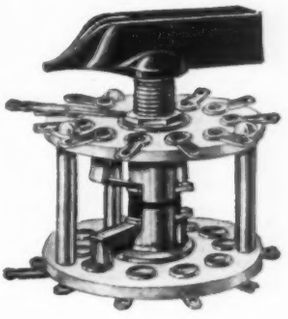
RELAYS, Continuous Current
Allen-Bradley Co.
American Automatic Elec.
American Inst. Co.
Autocall Co.
Clare & Co.
General Elec. Co.
Guardian Elec. Mfg. Co.
H-B Inst. Co., Inc.
Kellogg Switchboard
Paragon Electric Co.
Struthers-Dunn
Ward Leonard Elec. Co.
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.

RELAYS, Control
Allen-Bradley Co.
Advance Electric Co.
American Automatic Elec.
American Inst. Co.
Autocall Co.
Automatic Switch Co.
Betts & Betts
Brown Inst. Co.
Clare & Co.
Cutler-Hammer, Inc.
Electric Controller
Friez & Sons
General Controls Co.
General Elec. Co.
Guardian Elec. Mfg. Co.
Hagan Corp.
H-B Inst. Co., Inc.
Industrial Eng. Corp.
Kellogg Switchboard
Miller Co., Bertrand F.
Minneapolis-Honeywell
Monitor Controller Co.
Perfex Corp.
Precision Therm. & Inst.
Roller-Smith Co.
Standard Elect. Prods.
Struthers-Dunn
United Cinephone Corp.
Ward Leonard Elec. Co.
Western Electro-Mech.
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.

FOR *Permanent* LOW CONTACT RESISTANCE, *use the*

SHALLCROSS

ROTARY SELECTOR SWITCH



Particularly designed for use with the Thermocouple and other instrument circuits, also to control circuits such as found in high grade electrical apparatus.

Made with a very superior ceramic switch plate known as "steatite" and has *eleven solid "fine" silver contacts and contact arms.* The average contact resistance in this switch is .00075 ohms or less. Supplied with more or fewer contacts, with or without stops, shorting (bridging) or non-shorting.

Cost slightly more — but worth much more because they last longer, are more accurate.

Write for Switch Bulletin No. 141-HS

"Akra-Ohm" Resistors

Precision calibrated resistors can be furnished with an accuracy of 1%, .5%, .25% and 0.1%; ranging from .1 ohm to 10,000,000 ohms. Available in many types and forms described in Bulletin No. 122-HS.

SHALLCROSS MFG. CO.
Instruments — Resistors — Switches
COLLINGDALE, PA.

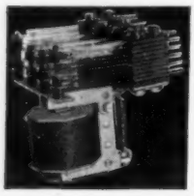
For addresses, see pages 66-76

RELAYS by GUARDIAN

. . . for AC or DC Operation —

★ Relays—Solenoids and Stepping Switches illustrated below suggest a few of the numerous types of Electrical Control Units obtainable at Guardian Electric, in both industrial and *Government Approved* types.

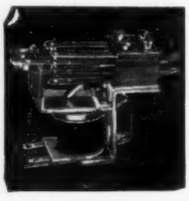
If you need COMPACT and highly sensitive controls that possess quick responsiveness and precision of action—with MAXIMUM CONTROL in *minimum space*—you will get it ALL at Guardian. Controls by Guardian are furnished to operate on any specified voltage up to 220 DC—440 AC—and on any current from .5 milliamperes to 30 amperes. Contact capacities to 1500 watts.



ALTERNATING CURRENT RELAYS

Series 30 AC. (left) Supplied in three types of mountings, voltage range .1 to 440 volts, contact capacity 42 contacts. Size 2¾x1½x2½".

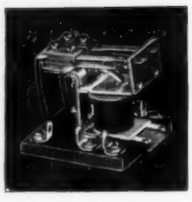
Series 110 AC. (right) Compact, economical, widely used unit. Four pole, double throw contact capacity, 220 volt limit. Size 2¾x⅞x1 15/16".



DIRECT CURRENT RELAYS

Series 5 DC (left) Current draw as low as .009 watts—furnished completely enclosed—contact limit, double pole, double throw. Size 3¼x3¼x2".

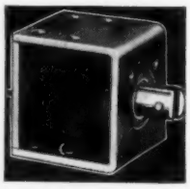
Series 115 DC (right) Four pole, double throw contact capacity, rapid change over of contacts, full floating, permanently locked armature, economical of space and cost.



Type-R Stepping Relay

S-T-E-P-P-I-N-G RELAYS

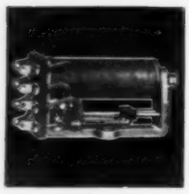
Versatile, advanced designs, simple in principle. New applications for these units are appearing constantly giving circuit control hitherto thought impossible. Rigidity of construction guarantees long life. Innumerable variations available. A.C. or D.C.



SOLENOIDS —AC; DC

Type No. 2. Efficient—powerful—compact. For electro-mechanical operations involving remote control of mechanical motions such as electric counting, valve control and operation, faulty material ejector, automatic brake, electric racheting, etc. 1½x1½x1⅝".

GOVERNMENT APPROVED RELAYS



BK-10 RELAY (left) Precisely counter-balanced to resist extreme vibrations. Built to rigid U.S. Signal Corps specifications.

BK-16 RELAY (right) Built to minimum tolerances. A production line product. Furnished to custom-built specifications. Another Signal Corp Relay by Guardian.

★ **WRITE TO GUARDIAN** for free engineering assistance on any electrical control problem. No obligation. Ask for Big 1941 Catalog L, with illustrations and specifications on our complete line.

GUARDIAN ELECTRIC

1621 West Walnut Street Chicago, Illinois

RELAYS, Demand Totalizing
Autocall Co.
General Elec. Co.
Hagan Corp.
Therm-Electric Meters Co.
United Cinephone Corp.
Westinghouse Elec. & Mfg.

RELAYS, Electromagnetic
Advance Electric Co.
Allen-Bradley Co.
American Automatic Elec.
American Inst. Co.
Autocall Co.
Automatic Switch Co.
Bunnell & Co.
Eby, Inc.
Clare & Co.
Cutler-Hammer, Inc.
Friez & Sons
General Elec. Co.
G-M Labs.
Guardian Elec. Mfg. Co.
H-B Inst. Co.
Industrial Eng. Corp.
Kellogg Switchboard
Kurman Electric Co.
Leach Relay Co.
Miller Co., Bertrand F.
Minneapolis-Honeywell
Monitor Controller Co.
Penn Electric Switch Co.
Perfex Corp.
Phila. Thermometer Co.
Precision Therm. & Inst.
Sigma Instruments, Inc.
Standard Elect. Prods.
Struthers-Dunn
United Cinephone Corp.
Ward Leonard Elec. Co.
Western Electro-Mech.
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.
White-Rodgers Electric
Zenith Electric Co.

RELAYS, Frequency
Autocall Co.
Clare & Co., C. P.
Cutler-Hammer, Inc.
Esterline-Angus Co.
Hickok Electrical Inst.
United Cinephone Corp.
Ward Leonard Electric Co.

RELAYS, Galvanometer
Autocall Co.
Eby, Inc., Hugh H.
G-M Laboratories, Inc.
Rubicon Co.
Tagliabue Mfg. Co., C. J.

RELAYS, Heavy Duty
Allen-Bradley Co.
American Automatic Elec
American Inst. Co.
Autocall Co.
Automatic Switch Co.
Cutler-Hammer, Inc.
General Elec. Co.
H-B Inst. Co., Inc.
Miller Co., Bertrand F.
Monitor Controller Co.
Penn Electric Switch
Philadelphia Thermometer
Ward Leonard Elec. Co.
Westinghouse Elec. & Mfg.
Zenith Electric Co.

RELAYS, Instrument Controlled
American Automatic Elec.
American Inst. Co.
Autocall Co.
Brown Inst. Co.
Clare & Co.
Cramer & Co., Inc.
Friez & Sons
General Elec. Co.
Guardian Elec. Mfg. Co.
H-B Inst. Co., Inc.
Kurman Electric Co.
Minneapolis-Honeywell
Perfex Corp.
Phila. Thermometer Co.
Precision Therm. & Inst.
Roller-Smith Co.
Struthers-Dunn
Tagliabue Mfg. Co.
Triplett Electrical Inst.
United Cinephone Corp.
Ward Leonard Elec. Co.
Weston Elec. Inst. Corp.

RELAYS, Light Sensitive (See Photoelectric below)

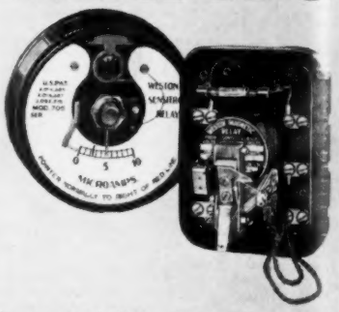
RELAYS, Magnetic (See Relays, Electro-Magnet)

RELAYS, Mercury
American Automatic Elec.
American Inst. Co.
Autocall Co.
Continental Elec. Co.
Guardian Electric
H-B Elec. Co., Inc.
Loewenberg, F.
Precision Therm. & Inst.
Weston Elec. Inst. Corp.

RELAYS, Mercury Tube
American Inst. Co.
Autocall Co.
Brown Inst. Co.
Clare & Co.
General Control Co.
G-M Labs.
Guardian Elec. Mfg. Co.
H-B Elec. Co., Inc.
Minneapolis-Honeywell
Phila. Thermometer Co.
Precision Therm. & Inst.
Struthers-Dunn
Ward Leonard Elec. Co.
Weston Elec. Inst. Corp.

SENSITIVE and POWER

RELAYS



A complete line of sensitive relays and contact making indicators . . . including the Sensitrol Relay which provides positive control at energy levels as low as 1 millivolt or 2 microamperes, handling 5 watts at 110 volts on magnetic contacts. Also Time Delay Relays and Power Relays for operation from sensitive relay contacts. Bulletins available. Weston Electrical Instrument Corporation, 591 Frelinghuysen Ave., Newark, New Jersey.

WESTON *Instruments*

AGASTAT

The Name for TIME-DELAY RELAY

An instantaneous recycling unit giving a delay interval ranging from a fraction of a second to several minutes, for use in electrical apparatus and equipment.

Positive, snap-action contacts, normally open, normally closed, or both. Single or double-pole. Offers a diversity of timing effects by different circuit combinations. Simple field adjustment. Unaffected by dust, temperature, humidity or voltage fluctuations.

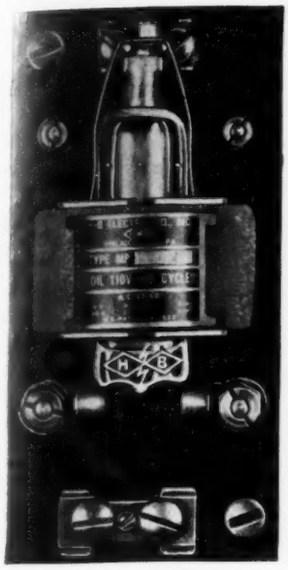
Write Today for Bulletin N-4.

AMERICAN GAS ACCUMULATOR CO.

Electrical Division

ELIZABETH • NEW JERSEY

For addresses, see pages 66-76



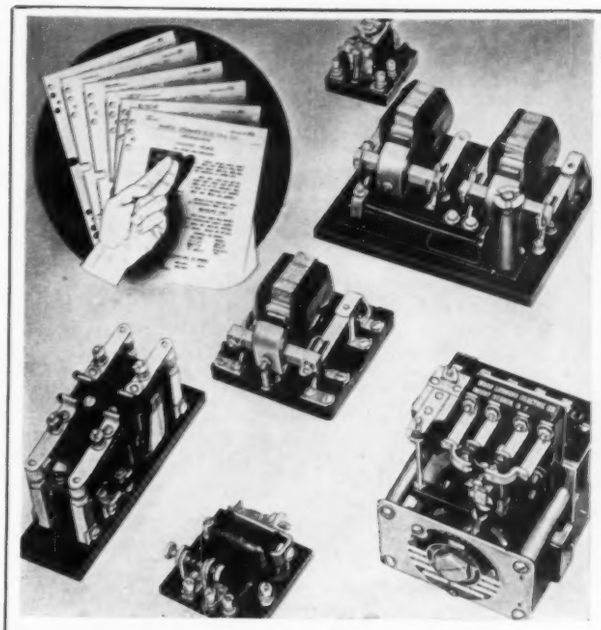
★

SENSITIVE RELAY IMPROVES INSTRUMENT PERFORMANCE

★

★ Your instruments can be made more sensitive with the use of this H-B relay. Maintenance-free and tested for ten million uninterrupted operations. Dirt or dust can't stop it. The relay with only one moving part—simplicity assures long life. Bulletin A fully describing its many features sent on request.

H-B ELECTRIC COMPANY INC
MANUFACTURERS OF H B ELECTRICAL DEVICES
2501 N. BROAD STREET, PHILADELPHIA, PENNA.



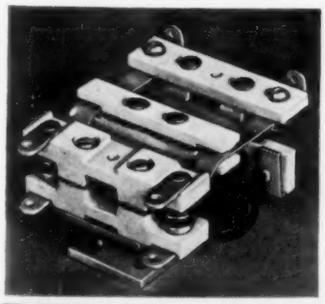
SEND FOR THIS RELAY DATA

Describing midget, intermediate, and heavy duty, sensitive type, time delay and motor driven relays in all contact combinations.

WARD LEONARD
38 SOUTH STREET MOUNT VERNON, N. Y.
ELECTRIC CONTROLS SINCE 1892

DESIGNED...
FOR ACCURACY IN ELECTRIC CONTROL

RUGGED, COMPACT, LOW POWER CONSUMPTION OF 1.5 WATTS, HIGH POWER OUTPUT OF 2,000 WATTS

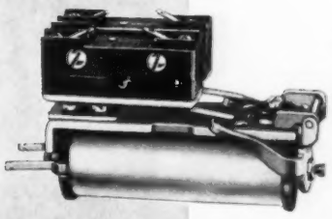


This Kurman relay was designed to meet the need for a high quality medium duty relay at low cost. The magnet coil is wound on a Bakelite core and Alsimag non-hygroscopic insulation is employed. Contacts are quarter inch coin silver.

KURMAN ELECTRIC CO.
INCORPORATED
241 Lafayette Street, New York, N. Y.

CLARE *Type "F"*

Micro-switch • Snap-action Contact



RELAY

Operates on a *few milli-amperes*—contacts carry *10 amperes 110 V. a.c.* Particularly adapted to machine control, motor and lamp loads, photo electric, and similar applications.

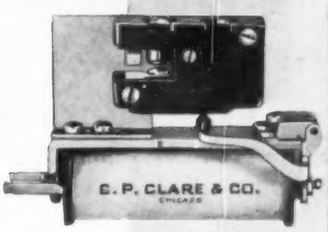
C. P. CLARE & CO.
LAWRENCE & LAMON AVES. - - CHICAGO
15 EAST 26TH STREET NEW YORK CITY

CLARE *Type "FM"*

Snap-action Contact

RELAY

For slightly heavier loads—contacts rated *15 amperes 110 V. a.c.* Operates on low coil current and adaptable to similar applications.



Write for Clare Data Book and Catalog today.

Precision Resistor Company
MICROHM
WIRE WOUND RESISTORS
A Preferred Product
•
OUTSTANDING CONCERNS
REPEAT and REPEAT
AGAIN and AGAIN
THEIR PURCHASES OF
MICROHM
RESISTORS
Continued Preference is Best Proof of Uniform, Constant, Dependable QUALITY
Complete service and advice on any and all of your resistance and equipment problems.
•
Precision Resistor Company
334 BADGER AVENUE • NEWARK, N. J.

Super DAVOHM
wire wound PRECISION RESISTORS

Recommended for use in exacting equipment where accuracy, stability and dependability over long periods of time are of prime importance.
Accuracies from ± 1% to ± 0.1% available
Prices and literature upon request
THE DAVEN COMPANY
158 SUMMIT STREET • NEWARK, N. J.

RELAYS, Motor Driven Time Delay
Advance Electric Co.
American Inst. Co.
Betts & Betts
Controls, Inc.
Cramer & Co., Inc.
Southw'n Electronics Lab.
Struthers-Dunn
Friez & Sons
General Elec. Co.
Industrial Eng. Corp.
Monitor Controller Co.
Paragon Electric Co.
Ward Leonard Elec. Co.
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.
Zenith Electric Co.

RELAYS, Movable Coil A.C.
Esterline-Angus Co.
General Elec. Co.
Weston Elec. Inst. Corp.

RELAYS, Overload
Allen-Bradley Co.
Autocall Co.
Bunnell & Co.
Burlington Inst. Corp.
Cutler-Hammer, Inc.
Edison Electrical Controls
Electric Controller
General Elec. Co.
Guardian Elec. Mfg. Co.
Leach Relay Co.
Penn Electric Switch
Roller-Smith Co.
Standard Elect. Prods.
Struthers-Dunn
Ward Leonard Elec. Co.
Westinghouse Elec. & Mfg.

RELAYS, Permanent Magnet Movable Coil
Bunnell & Co.
Esterline-Angus Co.
General Elec. Co.
Triplett Electrical Inst.
Weston Elec. Inst. Corp.

RELAYS, Photoelectric
Advance Electric Co.
American Inst. Co.
Eby, Inc.
Clare & Co.
Continental Elec. Co.
Cutler-Hammer, Inc.
Dickson Co.
Electronic Lab.
Electronic Prod. Co.
Ess Instrument Co.
General Controls Co.
General Elec. Co.
G-M Labs.
Leach Relay Co.
Lipman Engg. Co.
Lumenite Elec. Co.
Luxtrol Co., Inc.
Photobell Corp.
Photoswitch, Inc.
Precision Therm. & Inst.
Rehtron Corp.
Sigma Instruments, Inc.
Tagliabua Mfg. Co.
United Cinephone Corp.
Ward Leonard Elec. Co.
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.

RELAYS, Polarized
American Automatic Elec.
Autocall Co.
Edison Electrical Controls
L. A. B. Corp.
Miller Co., Bertrand F.
Precision Therm. & Inst.
Struthers-Dunn
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.

RELAYS, Power
American Automatic Elec.
American Inst. Co.
Automatic Switch Co.
Esterline-Angus Co.
General Controls Co.
General Elec. Co.
Hagan Corp.
Struthers-Dunn
Ward Leonard Elec. Co.
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.

RELAYS, Power Factor
Esterline-Angus Co.
L. A. B. Corp.
Westinghouse Elec. & Mfg.

RELAYS, Resistance, D-c.
Advance Electric Co.
Autocall Co.
Automatic Electric Co.
Bunnell & Co.
Clare & Co., C. P.
Cutler-Hammer, Inc.
Dunn, Inc., Struthers
Guardian Electric
Leach Relay Co.
Standard Elect. Products

RELAYS, Stepping
Autocall Co.
Automatic Electric Co.
Dunn, Inc., Struthers
G-M Laboratories, Inc.
Guardian Electric
Roller-Smith Co.

RELAYS, Telephone Auxiliary Ringing
Advance Electric Co.
American Automatic Elec.
Autocall Co.
Clare & Co.
Kellogg Switchboard
Kurman Electric Co.
Leach Relay Co.
Standard Elect. Prods.
Struthers-Dunn
Western Electro-Mech.

RELAYS, Temperature
Autocall Co.
Clare & Co., C. P.
Dunn, Inc., Struthers
Edison Electrical Controls
Friez & Sons
Gleason-Avery, Inc.
G-M Laboratories, Inc.
Guardian Electric
Leach Relay Co.
Minneapolis-Honeywell
Photobell Corp.
Spencer Thermostat Co.
Tagliabue Mfg. Co., C. J.
United Cinephone Corp.
Weston Electrical Inst.

RELAYS, Thermal Time Delay
Advance Electric Co.
Allen-Bradley Co.
American Automatic Elec.
Am. Gas Accumulator
American Inst. Co.
Autocall Co.
Automatic Temp. Control
Betts & Betts
Cramer & Co., Inc.
Cutler-Hammer, Inc.
Eagle Signal Corp.
Edison Electrical Controls
Electric Controller
Electronic Prod. Co.
Friez & Sons, Jr.
General Elec. Co.
Guardian Elec. Mfg. Co.
Industrial Eng. Corp.
Loewenberg, F.
Luxtrol Co., Inc.
Magnetic Gauge Co.
Paragon Electric Co.
Perfex Corp.
Photobell Corp.
Precision Therm. & Inst.
Preferred Utilities Mfg.
Spencer Thermostat Co.
Standard Elect. Prods.
Struthers-Dunn
Ward Leonard Elec. Co.
Weston Elec. Inst. Corp.
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.
White-Rodgers Electric
Zenith Electric Co.

RELAYS, Time Delay (See Relays, Thermal Time Delay)

RELAYS, Transformer (Low Voltage)
Allen-Bradley Co.
Eclipse Aviation
Friez & Sons
General Controls Co.
Gleason-Avery, Inc.
Guardian Elec. Mfg. Co.
H-B Inst. Co., Inc.
Industrial Eng. Corp.
Miller Co., Bertrand F.
Minneapolis-Honeywell
Paragon Electric Co.
Penn Electric Switch
Perfex Corp.
Sigma Instruments, Inc.
Struthers-Dunn
Westinghouse Elec. & Mfg.
White-Rodgers Electric

RELAYS, Vacuum Contact
American Automatic Elec.
American Inst. Co.
Edison Electrical Controls

RELAYS, Vacuum Tube
American Inst. Co.
Continental Elec. Co.
Eby, Inc.
Electro-Medical Lab.
Electronic Prod. Co.
General Controls Co.
General Elec. Co.
G-M Labs.
L. A. B. Corp.
Lumenite Elec. Co.
Luxtrol Co., Inc.
Photobell Corp.
Precision Therm. & Inst.
RCA Manufacturing Co.
Sargent & Co.
Sigma Instruments
Standard Elect. Prods.
Struthers-Dunn
Tagliabue Mfg. Co.
United Cinephone Corp.

RELAYS, Voltage
Advance Electric Co.
Allen-Bradley Co.
Autocall Co.
Automatic Switch Co.
Clare & Co., C. P.
Cutler-Hammer, Inc.
Dunn, Inc., Struthers
Eby, Inc., Hugh H.
Esterline-Angus Co.
Ferranti Electric, Inc.
Hart Manufacturing Co.
Hathaway Inst. Co.
Leach Relay Co.
Photobell Corp.
Reliance Instrument Co.
Roller-Smith Co.
Standard Elect. Products
Ward Leonard Electric Co.
Triplett Electrical Inst.
Weston Electrical Inst.

REMOTE-CONTROL EQUIPMENT
Allen-Bradley Co.
American Automatic Elec.
Area Regulators, Inc.
Askania Regulator Co.
Atlas Valve Co.
Autocall Co.
Bailey Meter Co.
Bristol Co.
Brooke Eng. Co.
Brown Inst. Co.
Clare & Co.
Cutler-Hammer, Inc.
Davis Reg. Co.
Elec. Indicator Corp.
Electrimatic Corp.
Electronic Lab.
Elsbett Mfg. Co.
Foxboro Co.
General Elec. Co.
Guardian Electric
Hagan Corp.
Hanlon-Waters, Inc.
Hart Mfg. Co.
Hays Corp.
H-B Inst. Co., Inc.
Illinois Eng. Co.
International Filter Co.
Kollsman Inst. Co.
Kurman Electric Co.
Luxtrol Co., Inc.
Mason-Neilan Regulator
Minneapolis-Honeywell
Perfex Corp.
Photobell Corp.
Powers Regulator Co.
RCA Manufacturing Co.
Republic Flow Meters
Scientific Inst. Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
United Cinephone Corp.
Zenith Electric Co.

REMOTE-METERING EQUIPMENT, ELECTRICAL
Andrew, Victor J.
Automatic Temp. Control
Bristol Co.
Brown Inst. Co.
Builders Iron Foundry
Elec. Indicator Corp.
Elec. Tachometer Corp.
Esterline-Angus Co.
Foxboro Co.
General Elec. Co.
W. & L. E. Gurley
Kellogg Switchboard
Kurman Electric Co.
L. A. B. Corp.
Leeds & Northrup Co.
Mason-Neilan Regulator
Moisture Register Co.
Morey & Jones, Ltd.
Pioneer Instrument
Republic Flow Meters
Tagliabue Mfg. Co.
Therm-Electric Meters
Westinghouse Elec. & Mfg.

REMOTE-METERING EQUIPMENT, HYDRAULIC
Brown Inst. Co.
Builders Iron Foundry
International Filter Co.
Leupold, Volpel & Co.
Westinghouse Elec. & Mfg.

REMOTE-METERING EQUIPMENT, PNEUMATIC
American Meter Co.
Bristol Co.
Brown Inst. Co.
Foxboro Co.
Mason-Neilan Regulator
Taylor Inst. Cos.

RESISTANCE LOADING EQUIPMENT
Eastern Specialty Co.
Hardwick, Hindle, Inc.
Internat onal Resistance.
Precision Resistor Co.

RESISTANCES
Allen-Bradley Co.
Beck Bros.
Central Scientific Co.
Clarostat Mfg. Co.
Cutler-Hammer, Inc.
Daven Co.
General Radio Co.
Instrument Resistors, Inc.
International Resistance
Ohmite Mfg. Co.
Precision Resistor Co.
Sensitive Research Inst.
Shallcross Mfg. Co.

RESISTORS, Adjustable
Ward Leonard Electric Co.

RESISTORS, CARBON COMPRESSION
Allen Bradley Co.
Beck Bros.
International Resistance
Le Carbone Co., Inc.
Nat'l Carbon Co., Inc.
Ohio Carbon Co.
O. S. Peters
Speer Carbon Co.
Welch Scientific Co.
Eastern Specialty Co.
Hardwick, Hindle, Inc.
International Resistance
Precision Resistor Co.

RESISTORS, High Frequency
Beck Bros.
Daven Co.
General Radio Co.
Hardwick, Hindle, Inc.
Instrument Resistors, Inc.
International Resistance
Leeds & Northrup Co.
Measurements Corp.
Ohmite Mfg. Co.
Shallcross Mfg. Co.
Ward Leonard Electric Co.

RESISTORS, High Voltage
Beck Bros.
Clarostat Mfg. Co.
Hardwick, Hindle, Inc.
Instrument Resistors, Inc.
International Resistance
J B L Instrument Co.
Ohmite Mfg. Co.
Shallcross Mfg. Co.
Ward Leonard Electric Co.

RESISTORS, Manganin
Beck Bros.
Daven Co.
General Radio Co.
Gray Instrument Co.
Hardwick, Hindle, Inc.
Instrument Resistors, Inc.
Leeds & Northrup Co.
Rubicon Co.
Shallcross Mfg. Co.

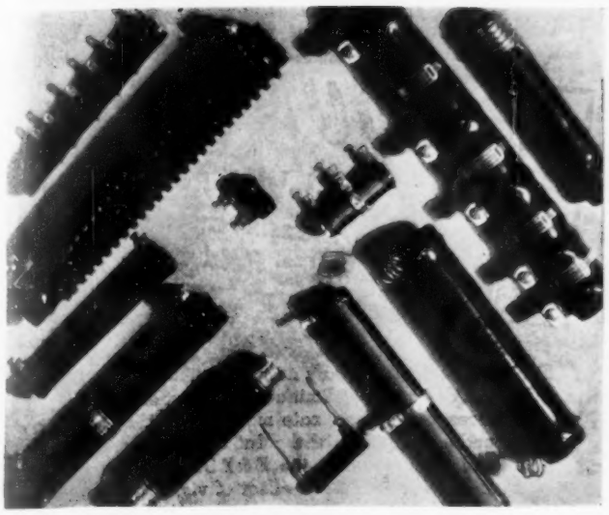
RESISTORS, Molded
Allen-Bradley Co.
Beck Bros.
Clarostat Mfg. Co.
International Resistance
Muter Co.
Triplett Electrical Inst.

RESISTORS, Standard (See Standards, Resistance)

RESISTORS, Variable
Allen-Bradley Co.
Beck Bros.
Clarostat Mfg. Co.
Cutler-Hammer, Inc.
General Radio Co.
Gray Instrument Co.
Hardwick, Hindle, Inc.
Instrument Resistors, Inc.
International Resistance
Leeds & Northrup Co.
National Electric Control.
Ohmite Mfg. Co.
Rex Rheostat Co.
Rubicon Co.

Taylor
Remote Pneumatic Transmission Systems
Write for complete information and catalogs.
Taylor Instrument Companies
ROCHESTER, N.Y. TORONTO, CANADA

For addresses, see pages 66-76



SEND FOR THIS

RESISTOR DATA

The Ward Leonard line of resistors is complete, so includes all sizes and all ratings in fixed and adjustable types.

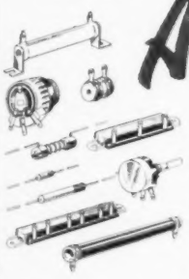
Send for circular 507. It not only gives Resistor data but other valuable dope for the ham.

WARD LEONARD

38 SOUTH STREET, MOUNT VERNON, N. Y.

ELECTRIC CONTROL DEVICES SINCE 1892

RESISTOR PROBLEMS *Answered!*



With quality and dependability as prime considerations, IRC engineers are constantly supplying a resistance engineering service of inestimable value to many manufacturers. This service, backed by the world's most complete line of fixed and variable resistance units, is yours for the asking. Bulletins free on any of the following types:

- 2 sizes Variable Metallized Controls
- 4 sizes Insulated Metallized Resistors
- 10 sizes High Frequency Metallized Resistors (1 3 to 150 watts)
- 4 sizes Ultra-High Range Metallized Resistors
- 3 sizes All-Metal Power Rheostats (2 to 50 watts)
- 2 sizes Attenuators
- 7 sizes Insulated Wire Wound Resistors ($\frac{1}{2}$ to 20 watts)
- 5 sizes High Voltage Metallized Resistors
- 5 sizes Metallized Suppressors
- 12 sizes Precision Wire Wound Resistors
- 53 sizes Fixed and Variable Power Wire Wound Resistors

INTERNATIONAL RESISTANCE COMPANY

417 N. Broad St., Phila., Pa.

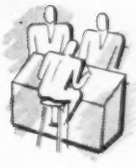
IRC

Get this Handy New

OHMITE

Ohm's Law Calculator

Solves any Ohm's Law Problem with one setting of the slide.



Here's the handiest Ohm's Law Calculator ever devised. Figures Amperes, Volts, Watts, Ohms—quickly, easily, accurately! Requires no slide rule knowledge. All values are direct reading. Scales on both sides cover the current and wattage range for motors, generators, lamps, electrical apparatus and other applications up to 100 amperes or 1000 watts; also the low current high resistance radio, sound and electronic applications. Has convenient Stock Unit Selector—a setting of the slide tells the stock number of the resistor or rheostat you may need. Size 4⅛"x9". Specially designed by Ohmite Engineers. Available for only 10c to cover handling cost.

Send for your Calculator today. Use Coupon or write on company letterhead giving name and position.

OHMITE MANUFACTURING COMPANY
4886 FLOURNOY STREET, CHICAGO, U.S.A.

10c in Coin enclosed. Send Ohm's Law Calculator. *(Please Print Clearly)*

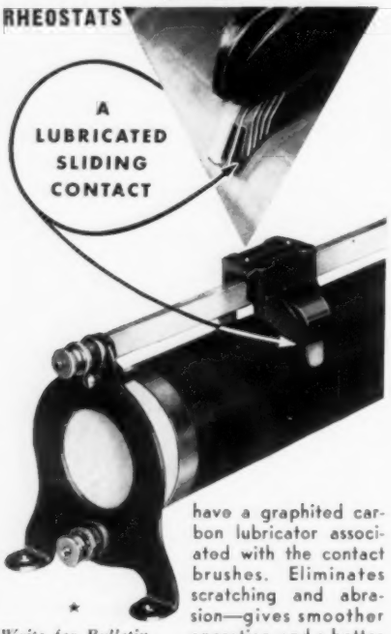
Name .....
Firm Name .....
Position .....
Address .....
City ..... State .....

Instruments—Jan.

Be Right with **OHMITE**

RHEOSTATS • RESISTORS • TAP SWITCHES

JAGABI "Lubri-tact" RHEOSTATS



have a graphited carbon lubricator associated with the contact brushes. Eliminates scratching and abrasion—gives smoother operation and a better contact. Makes Jagabi Rheostats *better* rheostats.

Write for Bulletin 1620-I which lists new lower prices.

JAMES G. BIDDLE CO.
Electrical Instruments
1211-13 Arch Street Philadelphia, Pa.

Rex Four-Range Rheostats
with Lubricated contacts

A New Development

Write for Bulletin S.

THIS rheostat incorporates 4 different ohmic resistance values, for instance—Cat. No. 421:

1. **RANGE:** 465 ohms, .8 amps.
2. **RANGE:** 320 ohms, 1 amps.
3. **RANGE:** 145 ohms, 1.5 amps.
4. **RANGE:** 100 ohms, 1.8 amps.

Available in 2 sizes: 350 and 650 Watt; 10 Units.

Rex Rheostat Co.

37 West 20th St., New York, N. Y.

RESISTORS, Wire Wound
Beck Bros.
Biddle Co., Jas. G.
Clarostat Mfg. Co.
Cutler-Hammer, Inc.
Daven Co.
General Radio Co.
Gray Instrument Co.
Hardwick, Hindle, Inc.
Instrument Resistors, Inc.
International Resistance
Leeds & Northrup Co.
Muter Co.
National Electric Control.
Ohmite Mfg. Co.
Rex Rheostat Co.
Rubicon Co.
Shallcross Mfg. Co.
Triplett Electrical Inst.
Ward Leonard Electric Co.

RHEOSTATS, Battery Charging
Allen-Bradley Co.
Beck Bros.
Cutler-Hammer, Inc.
Hardwick, Hindle, Inc.
International Resistance
National Elec. Controller
Ohmite Mfg. Co.
Rex Rheostat Co.
Schaefer Bros. Co.
Ward Leonard Elec. Co.

RHEOSTATS, Laboratory
Allen-Bradley Co.
American Inst. Co.
Beck Bros.
Biddle Co., Jas. G.
De Jur-Amsco Corp.
Central Scientific Co.
Chicago Apparatus Co.
Eastern Specialty Co.
General Radio Co.
G-M Labs.
Hardwick, Hindle, Inc.
National Elec. Controller
Ohmite Mfg. Co.
Rex Rheostat Co.
Rubicon Co.
Schaefer Bros. Co.
Ward Leonard Elec. Co.

RHEOSTATS, Meter Testing
Allen-Bradley Co.
Beck Bros.
Biddle Co., Jas. G.
De Jur-Amsco Corp.
Eastern Specialty Co.
Hardwick, Hindle, Inc.
International Resistance
Leeds & Northrup
National Elec. Controller
Ward Leonard Elec. Co.

RHEOSTATS, Slide Wire
Beck Bros.
Biddle Co., Jas. G.
Central Scientific Co.
Chicago Apparatus Co.
General Radio Co.
Hardwick, Hindle, Inc.
G-M Labs.
Leeds & Northrup
National Elec. Controller
Rex Rheostat Co.
Rubicon Co.
Shallcross Mfg. Co.
Ward Leonard Elec. Co.

RIDEOMETERS. RIDE COMFORT Recorders & Riding-Quality Instruments
Commercial Engg. Labs.
Impact Register Co.
Jaeger Watch Co.
Sperry Products, Inc.

RULES, Adjustable Curve (See Drawing Instruments)

RULES, Aluminum
Keuffel & Esser Co.
Lufkin Rule Co.
Warren-Knight Co.

RULES, Brass
Bliss & Co.
Lufkin Rule Co.
Mico Instrument Co.
Starrett Co.
Warren-Knight Co.

RULES, Caliper
Glogau & Co.
Lufkin Rule Co.
Millers Falls Co.
Starrett Co
Union Tool Co.
Warren-Knight Co.

RULES, Drafting Room (See Drawing Instruments)

RULES, Folding
Bliss & Co.
Dietzen Co.
Keuffel & Esser Co.
Lufkin Rule Co.
Post Co., Frederick
Speidel & Co.
Starrett Co.
Warren-Knight Co.
Weber Co.

RULES, Glass
Fish-Schurman Co.
Glass Engraving Co.
Mico Instrument Co.

RULES, Parallel
Bliss & Co.
Dietzen Co.
Hamilton Mfg. Co.
Keuffel & Esser Co.
Negus, T. S. & J. D.
Speidel & Co.
Warren-Knight Co.
White Co., Inc.
Weber Co.

ANNOUNCING

New F & P STABL-VIS* Rotameter for flow rate measurement unaffected by changing fluid viscosity!

*Trade Mark Reg.

Fischer & Porter Company now offers the STABL-VIS* rotameter designed to eliminate the effect of changing fluid viscosity from flow rate measurement. Based on the sound application of the latest developments in fluid mechanics research, the F & P STABL-VIS rotameter renders negligible the effect of viscosity changes from as low as 0.1 centipoises to as high as 50.0 centipoises on rotameter calibrations.

This F & P development makes complete the superiority of the rotameter sight flow meter over manometer type flow meters. Visibility, accuracy, simplicity of installation, linear scale and corrosion resistance have already established a preference for F & P rotameters with precision-bore tubes. Now, the development of the STABL-VIS rotameter again raises the standards of flow rate measuring practice.

F&P ROTAMETERS

WRITE FOR COMPLETE INFORMATION

FISCHER & PORTER CO.
63 W. QUEEN LANE, PHILADELPHIA, PA.

RULES, Precision Standard Gaertner Scientific Corp.

RULES, Shrinkage
Keuffel & Esser Co.
Lufkin Rule Co.
Speidel & Co.
Starrett Co.
Warren-Knight Co.
Weber Co.

RULES, Slide (See Drawing Instruments)

RULES, Slide, Psychrometric
Friez & Sons

RULES, Steel
Kern & Co.
Keuffel & Esser Co.
Lufkin Rule Co.
Mico Instrument Co.
Millers Falls Co.
Scherr Co., Inc.
Speidel & Co.
Starrett Co.
Union Tool Co.
Warren-Knight Co.
Weber Co.

RULES, Wood
Henschel & Co.
Keuffel & Esser Co.
Lufkin Rule Co.
Post Co., Frederick
Speidel & Co.
Warren-Knight Co.
Weber Co.

RUNNING TIME TOTALIZERS
Cramer & Co., Inc.
Elec. Tachometer Corp.
Jaeger Watch Co.
Production Instrument

SACCHARIMETERS
Akatos, Inc
Bausch & Lomb Opt.
Central Scientific Co.
Eimer & Amend
Moeller Instrument Co.
Rieker Inst. Co.
Sargent & Co.
Trerice Co.

SACCHAROMETERS
Central Scientific Co.
Eimer & Amend
Fleischhauer & Son
G. M. Mfg. Co., Inc.
H.B Inst. Co.
Kimble Glass Co.
Moeller Instrument Co.
Precision Therm. & Inst.
Rascher & Betzold
Rieker Inst. Co.
Ruehfel Co.
Scientific Inst. Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Wagner & Son

SALINITY INDICATORS
Bendix Marine Products
Central Scientific Co.
Eimer & Amend
Engineering Labs., Inc.
Fleischhauer & Son
G. M. Mfg. Co., Inc.
H-B Inst. Co.
Leeds & Northrup Co.
McNab of Bridgeport
Moeller Inst. Co.
Precision Therm. & Inst.
Rascher & Betzold
Ruehfel Co.
Schultheis Corp.
Scientific Inst. Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Trerice Co.

SALINOMETERS (See Salinity Indicators)

SAMPLER, Boiler Water
Natl. Aluminate Corp.

SAMPLERS, Oil
Braun Corp.
Central Scientific Co.
Pgh. Equitable Meter
Refinery Supply Co.
Scientific Glass Apparatus
Tagliabue Mfg. Co.

SAMPLERS, Oil Bottom-hole
Buska & Co., Inc.

SAMPLERS, Sewage
Builders Iron Foundry
Central Scientific Co.
International Filter Co.
Scientific Glass Apparatus

SAMPLERS, Silt
Central Scientific Co.

SCALES (See also object of measurement)

SCALES, Antimony Test
Howe Scale Co.
Seederer-Kohlbusch, Inc.
Troemner, Henry

SCALES, Automatic
Automatic Scale Co.
Buffalo Scale Co.
Chatillon & Sons
Exact Weight Scale
Fairbanks, Morse & Co.
Gump Co.
Howe Scale Co.
International Bus. Mach.
Jacobs Bros. Co., Inc.
Kron Co.
Merrick Scale Mfg. Co.
Richardson Scale Co.
Schaffer Poidometer Co.
Streeter-Amet Co.
Toledo Scale Co.
Triangle Package Mach.
Triner Sales Co.

SCALES, Bag Filling
Automatic Scale Co.
Exact Weight Scale Co.
Fairbanks, Moore & Co.
Gump Co.
Jacobs Bros. Co.
Kron Co.
Richardson Scale Co.
Syntron Company
Toledo Scale Co.
Triangle Package Mach.

SCALES, Basis Weight
Amthor Testing Inst. Co.
Becker, Inc., Christian
Buffalo Scale Co.
Exact Scale Co.
Howe Scale Co.
Kron Co.
Seederer-Kohlbusch
Thwing-Albert Instrument
Toledo Scale Co.
Torsion Balance Co.
Triner Sales Co.

SCALES, Bulk Weighing
Becker, Inc., Christian
Buffalo Scale Co.
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
Jacobs Bros. Co.
Kron Co.
Merrick Scale Mfg.
Richardson Scale Co.
Schaffer Poidometer Co.
Streeter-Amet Co.
Toledo Scale Co.
Torsion Balance Co.
Triangle Package Mach.
Triner Sales Co.
Troemner, Henry

SCALE, Cement Batching
Buffalo Scale Co.
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
Kron Co.
Richardson Scale Co.
Streeter-Amet Co.
Toledo Scale Co.
Triner Sales Co.

SCALES, Checking
Becker, Inc., Christian
Buffalo Scale Co.
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Jacobs Bros. Co., Inc.
Kron Co.
Merrick Scale Mfg. Co.
Richardson Scale Co.
Toledo Scale Co.
Torsion Balance Co.
Triner Sales Co.

For addresses, see pages 66-76

SCALES, Classifying
Exact Weight Scale Co.
Jacobs Bros. Co., Inc.
Kron Co.
Toledo Scale Co.
Triner Sales Co.

SCALES, Computing
Amthor Testing Inst.
Exact Weight Scale
International Bus. Mach.
Jacobs Bros., Inc.
Toledo Scale Co.
Triner Sales Co.

SCALES, Continuous Weighing
Buffalo Scale Co.
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Gump Co.
Jacobs Bros. Co.
Jeffrey Mfg. Co.
Kron Co.
Merrick Scale Mfg. Co.
Richardson Scale Co.
Schaffer Poidometer Co.
Streeter-Amet Co.
Syntron Company
Toledo Scale Co.
Triangle Package Mach.
United Cinephone Corp.

SCALES, Conveyor
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
International Bus. Mach.
Kron Co.
Merrick Scale Mfg. Co.
Richardson Scale Co.
Schaffer Poidometer Co.
Streeter-Amet Co.
Toledo Scale Co.

SCALES, Counting
Amthor Testing Inst. Co.
Buffalo Scale Co.
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
International Bus. Mach.
Jacobs Bros. Co.
Kron Co.
Seederer-Kohlbusch
Toledo Scale Co.
Triner Sales Co.
United Cinephone Corp.

SCALES, Crane
Buffalo Scale Co.
Chatillon & Sons
Fairbanks, Morse & Co.
Howe Scale Co.
Kron Co.

SCALES, Dairy
Becker, Inc., Christian
Buffalo Scale Co.
Central Scientific Co.
Chatillon & Sons
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
Humboldt Mfg. Co.
International Bus. Mach.
Jacobs Bros. Co.
Kron Co.
Streeter-Amet Co.
Toledo Scale Co.
Torsion Balance Co.
Triner Sales Co.
Troemner, Henry

SCALES, Differential
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Jacobs Bros. Co., Inc.
Kron Co.
Thwing-Albert Instrument

SCALES, Drawing (See Drawing Instruments)

SCALES, Dump
Buffalo Scale Co.
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
Kron Co.
Toledo Scale Co.

SCALES, Dynamometer
Central Scientific Co.
Chatillon & Sons
Dillon & Co.
Exact Weight Scale
Fairbanks, Morse & Co.
Howe Scale Co.
Kron Co.
Martin Decker Corp.
Seederer-Kohlbusch, Inc.
Toledo Scale Co.

SCALES, Estimating
Exact Weight Scale Co.
Jacobs Bros. Co.
Seederer-Kohlbusch, Inc.
Troemner, Henry

SCALES, Grain & Seed Testing
Amthor Testing Inst. Co.
Automatic Scale Co.
Becker, Inc., Christian
Buffalo Scale Co.
Central Scientific Co.
Chatillon & Sons
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Fisher Scientific Co.
Gump Co.
Howe Scale Co.
Jacobs Bros. Co.
Kron Co.
Newark Scale Works
Richardson Scale Co.
Streeter-Amet Co.
Toledo Scale Co.
Torsion Balance Co.
Triangle Package Mach.
Triner Sales Co.
Troemner, Henry

SCALES, Hopper
Buffalo Scale Co.
Chatillon & Sons
Exact Weight Scale
Fairbanks, Morse & Co.
Gump Co.
Howe Scale Co.
Jacobs Bros. Co.
Kron Co.
Richardson Scale Co.
Streeter-Amet Co.
Toledo Scale Co.

SCALES, Laboratory
Becker, Inc., Christian
Buffalo Scale Co.
Central Scientific Co.
Chatillon & Sons
Chicago Apparatus Co.
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Fisher Scientific Co.
Howe Scale Co.
Humboldt Mfg. Co.
International Bus. Mach.
Jacobs Bros. Co.
Microchemical Service
Newark Scale Works
Seederer-Kohlbusch, Inc.
Toledo Scale Co.
Torsion Balance Co.
Troemner, Henry

SCALES, Larry Car
Buffalo Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
Kron Co.
Richardson Scale Co.
Streeter-Amet Co.
Toledo Scale Co.

SCALES, Liquid
Jacobs Bros. Co., Inc.
Richardson Scale Co.

SCALES, Loss of Weight
Becker, Inc., Christian
Buffalo Scale Co.
Exact Weight Scale Co.
Jacobs Bros. Co.
Kron Co.
Seederer-Kohlbusch, Inc.
Streeter-Amet Co.
Toledo Scale Co.
Torsion Balance Co.

SCALES, Measuring
Automatic Scale Co.
Howe Scale Co.
Kron Co.
Richardson Scale Co.
Triner Sales Co.

SCALES, Over & Under
Becker, Inc., Christian
Buffalo Scale Co.
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
International Bus. Mach.
Jacobs Bros. Co.
Moisture Register Co.
Streeter-Amet Co.
Toledo Scale Co.
Torsion Balance Co.
Triner Sales Co.
Troemner, Henry

SCALES, Packaging
Automatic Scale Co.
Becker, Inc., Christian
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Gump Co.
Howe Scale Co.
Kron Co.
International Bus. Mach.
Jacobs Bros. Co.
Pneumatic Scale Corp.
Richardson Scale Co.
Toledo Scale Co.
Torsion Balance Co.
Triangle Package Mach.
Triner Sales Co.
Troemner, Henry

SCALES, Platform
Becker, Inc., Christian
Buffalo Scale Co.
Chatillon & Sons
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Gump Co.
Howe Scale Co.
Humboldt Mfg. Co.
International Bus. Mach.
Knowles Scale Works
Kron Co.
Streeter-Amet Co.
Toledo Scale Co.
Torsion Balance Co.
Triner Sales Co.

SCALES, Portable
Black & Decker
Buffalo Scale Co.
Central Scientific Co.
Chatillon & Sons
Exact Weight Scale
Fairbanks, Morse & Co.
Gump Co.
Howe Scale Co.
International Bus. Mach.
Jacobs Bros. Co.
Knowles Scale Works
Kron Co.
Richardson Scale Co.
Toledo Scale Co.
Triner Sales Co.

SCALES, Predetermined Weight
Becker, Inc., Christian
Buffalo Scale Co.
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Gump Co.
Howe Scale Co.
International Bus. Mach.

(Cont'd)

SCALES, Predetermined Weight (Continued)
Jacobs Bros. Co.
Merrick Scale Mfg. Co.
Richardson Scale Co.
Schaffer Poidometer Co.
Seederer-Kohlbusch, Inc.
Streeter-Amet Co.
Toledo Scale Co.
Torsion Balance Co.
Triner Sales Co.

SCALES, Recording
Buffalo Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
Kron Co.
Merrick Scale Mfg. Co.
Richardson Scale Co.
Streeter-Amet Co.
Toledo Scale Co.
Wallace & Tiernan

SCALES, Remote Indicating
Toledo Scale Co.

SCALES, Rolling Mill
Buffalo Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
Kron Co.
Streeter-Amet Co.
Toledo Scale Co.

SCALES, Sacking (See Scales, Bag-filling)

SCALES, Selecting
Exact Weight Scale
Toledo Scale Co.
United Cinephone Corp.

SCALES, Solder Test
Central Scientific Co.
Exact Weight Scale
Seederer-Kohlbusch, Inc.
Troemner, Henry

SCALES, Steel
Exact Weight Scale
Fairbanks, Morse & Co.
Howe Scale Co.
Kron Co.
Lufkin Rule Co.
Streeter-Amet Co.
Toledo Scale Co.

SCALES, Testing
Becker, Inc., Christian
Buffalo Scale Co.
Exact Weight Scale
Gump Co.
Howe Scale Co.
Humboldt Mfg. Co.
Jacobs Bros. Co.
Kron Co.
Newark Scale Works
Toledo Scale Co.
Torsion Balance Co.

SCALES, Textile
Becker, Inc., Christian
Buffalo Scale Co.
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
International Bus. Mach.
Kron Co.
Saxl Instrument Co.
Seederer-Kohlbusch, Inc.
Streeter-Amet Co.
Suter, Alfred
Toledo Scale Co.
Torsion Balance Co.
Triner Sales Co.

SCALES, Track
Buffalo Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
Kron Co.
Streeter-Amet Co.
Toledo Scale Co.

SCALES, Truck
Black & Becker
Buffalo Scale Co.
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Streeter-Amet Co.
Toledo Scale Co.

SCALES, Water Meter
Altender & Sons
Exact Weight Scale
Fairbanks, Morse & Co.
Jacobs Bros. Co.
Kron Co.
Toledo Scale Co.

SCALES, Yardage
Amthor Testing Inst.
Brown & Sharpe
Buffalo Scale Co.
Exact Weight Scale
Fairbanks, Morse & Co.
Howe Scale Co.
International Bus. Mach.
Kron Co.
Toledo Scale Co.

SCREENS, Solar Projecting
Fecker, J. W.

SCREENS, X-Ray Fluoroscopic
General Electric X-Ray
Kelley-Koett Mfg. Co.
Patterson Screen Co.
Westinghouse X-Ray Co.

SCREENS, X-Ray Intensifying (See Screens X-Ray Fluoroscopic)

SEED SIEVE SETS
Ballauf Mfg. Co.

SEGER CONES (See Cones, Pyrometric)

SEISMOGRAPHS
Akatos, Inc.
Alpha Instrument Co.
American Inst. Co.
Am. Telescope Labs.
Engineering Labs., Inc.
Geophysical Instrument
Heiland Research Corp.
Mico Instrument Co.
Miller Corp., Wm.
Ruska & Co., Inc.

SELF-OPERATING CONTROLLERS & REGULATORS, AUTOMATIC
Am. Automatic Elec.
American Inst. Co.
Arca Regulators, Inc.
Bailey Meter Co.
Betts & Betts
Brown Inst. Co.
Cutler-Hammer, Inc.
D'Este Co.
Dickson Co.
Elec. Indicator Corp.
Hanlon-Waters, Inc.
Lammert & Mann Co.
Leeds & Northrup Co.
Leslie Co.
Mason-Neilan Regulator
Minneapolis-Honeywell
Partlow Corp.
Penn Electric Switch Co.
Perfex Corp.
Ruggles-Klingemann
Scientific Inst. Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
United Transformer

SERVO-MOTORS, Electric Motor
Brown Inst. Co.
Eclipse Aviation
General Regulator Corp.
L. A. B. Corp.
Minneapolis-Honeywell

SERVO-MOTORS, Electric Solepoid
Brown Inst. Co.
Eclipse Aviation
Ruggles-Klingemann

SERVO-MOTORS, Hydraulic
Allis-Chalmers Mfg. Co.
Askania Regulator Co.
Eclipse Aviation
General Regulator Corp.
Hagan Corp.
Mason-Neilan Regulator
Ruggles-Klingemann

SERVO-MOTORS, Mechanical
Hagan Corp.

SERVO-MOTORS, Pneumatic
Askania Regulator Co.
Brown Inst. Co.
Hagan Corp.
Mason-Neilan Regulator
Minneapolis-Honeywell

SEXTANTS
Alpha Instrument Co.
Bausch & Lomb Opt.
Keuffel & Esser Co.
Kuner Co., Max
Master Optical Co.
Negus, T. S. & J. D.
Pioneer Instrument Co.
Warren-Knight Co.
White Co., Inc.

SHIP LOGS
Elec. Tachometer Corp.
Kenyon Instrument Co.
Negus, T. S. & J. D.
Pitometer Log Corp.

SHUNT METERS (See Meters, Shunt)

SHUNTS
Burton-Rogers Co.
Columbia Elec. Mfg.
Esterline-Angus Co.
General Elec. Co.
Hickok Elec. Inst. Co.
International Resistance
Precision Resistor Co.
Radio City Products Co.
Rawson Electrical Inst.
Roller-Smith Co.
Rubicon Co.
Sensitive Research Inst.
Triplett Electrical Inst.
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.

SHUNTS, Standard
Cambridge Instrument Co.
Esterline-Angus Co.
General Electric Co.
Gray Instrument Co.
Hickok Electrical Inst.
Instrument Resistors, Inc.
International Resistance
Leeds & Northrup Co.
Roller-Smith Co.
Rubicon Co.
Triplett Elec. Inst. Co.
Weston Elec. Inst. Corp.

SIEVE SHAKERS
Braun Corp.

SIEVES, TESTING
American Inst. Co.
Central Scientific Co.
Dietert Co.
Fisher Scientific Co.
Humboldt Mfg. Co.
Precision Scientific Co.
Richie Division
Scientific Inst. Co.
Weber Brothers Metal

SIGHT METERS
General Elec. Co.
G-M Labs.
Weston Elec. Inst. Corp.

SIGHTS, GUN, Telescopic
Bausch & Lomb Opt.
Clark & Sons
Fecker, J. W.
Kollmorgen Optical Co.
Perkin-Elmer Corp.
Zeiss, Inc., Carl

SIGNAL GENERATORS (See Generators, Signal)

SIGNALING DEVICES, Automatic
American Automatic Elec.
Autocall Co.
Betts & Betts
Bullard Co.
Cincinnati Time Rec.
Elec. Indicator Corp.
Foxboro Co.
General Elec. Co.
Guardian Elec. Mfg. Co.
Holtzer-Cabot Elec. Co.
International Bus. Mach.
Leslie Co.
Production Instrument
Spence Engineering Co.
Thompson Clock Co.
United Cinephone Corp.

SIGNALING DEVICES, Traffic
Am. Gas Accumulator
Bullard Co.
Eagle Signal Corp.
Edison Electrical Controls
Sangamo Electric Co.

SILICA, VITREOUS
Thermal Syndicate, Ltd.

SINE BARS
Ford Motor Co.

SLIDE RULES (See Drawing Instruments)

SLIDING GAGES (See Gages, Sliding)

SLUMP CONES (See Cones, Slump)

SMOKE DENSITY, Indicators & Recorders
Associated Research
Bailey Meter Co.
Boiler Room Equip.
Bristol Co.
Brooke Engineering
Denver Fire Clay Co.
Dickson Co.
Electronic Lab.
Ess Instrument Co.
General Elec. Co.
General Television Corp.
Leeds & Northrup Co.
Lumenite Elec. Co.
Luxtrol Co., Inc.
McNeill Eng. Equip.
Photobell Corp.
Photoswitch, Inc.
Preferred Utilities Mfg.
Rehtron Corp.
United Cinephone Corp.
Weston Elec. Inst. Corp.

SOLAR PROJECTING SCREEN (See Screen, Solar Projecting)

SOUND INDICATORS & ANALYZERS (See Indicators, Sound & Analyzers, Sound)

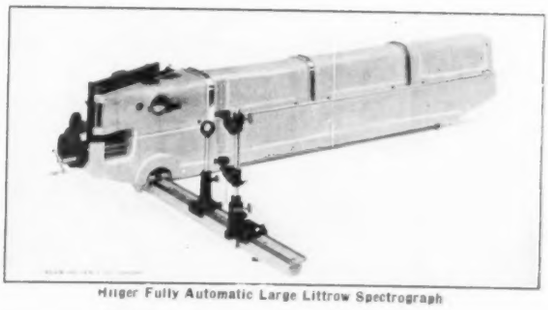
SOUND LEVEL METERS
Ballantine Labs.
Clough-Brengle Co.
Daven Co.
De Jur-Amsco Corp.
Electrical Research Prod.
Electronic Design Corp.
General Elec. Co.
General Radio Co.
Jones-Orme Co.
Precision Apparatus Corp.
Radio City Products Co.
Shallcross Mfg. Co.
Sound Apparatus Co.
Triplett Electrical Inst.
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.

SOUNDING LEADS
Ballauf Mfg. Co.
Bliss & Co.
Kenyon Instrument Co.
Kuner Co., Max
Moeller Instrument Co.
Negus, T. S. & J. D.

SOUNDING MACHINES
Ballauf Mfg. Co.
Bendix Marine Products
Kenyon Instrument Co.
Kuner Co., Max
Moeller Instrument Co.
Negus, T. S. & J. D.
Submarine Signal Co.

SOUNDING TUBES
Ballauf Mfg. Co.
Kimble Glass Co.
Moeller Instrument Co.
Negus, T. S. & J. D.

SPECIFIC GRAVITY Indicators & Recorders
American Meter Co.
Bailey Meter Co.
Binckley G. S.
Eimer & Amend
Foxboro Co.
Refinery Supply Co.
G M Mfg. Co.
Moeller Inst. Co.
Ruvutel Co.
Schultheis Corp.
Scientific Inst. Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Trerice Co.



Hilger Fully Automatic Large Littrow Spectrograph

ADAM HILGER, Ltd., London, England

Represented by **JARRELL-ASH COMPANY**

165 NEWBURY STREET BOSTON, MASS.

Outstanding laboratories throughout the world use

HILGER

Spectrographs
Spectrophotometers
Spectrometers
Monochromators
Microphotometers
Micrometers
X-Ray Diffraction Equipment
Polarimeters
Refractometers
Absorptiometers
Colorimeters
Interferometers

For addresses, see pages 66-76

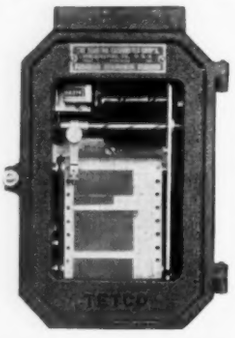
Standards... RESISTORS CAPACITORS INDUCTORS STANDARD CELLS

For use as reference standards of highest precision, or as working standards in routine potentiometer and bridge measurements, there is a complete L&N line of a-c and d-c resistors and resistance boxes, inductors and inductometers, air and mica capacitors, and standard cells.

LEEDS & NORTHRUP CO.
4984 STENTON AVENUE, PHILADELPHIA

MEASURING INSTRUMENTS · TELEMETERS · AUTOMATIC CONTROLS · HEAT-TREATING FURNACES

TETCO
Speed Recorder



Creates a permanent time record on a waxed chart. Accurately records rate of production, time and duration of stops, total quantity produced.

The Electric Tachometer Corp.
1358 Spring Garden St., Philadelphia, Pa.

BOULIN INSTRUMENTS

Stocked and distributed....

include:

- Speed Indicators
- Mechanical Stroboscopes Portable, Stationary and Remote Indicating Centrifugal Tachometers
- Tension Meters

•

BOULIN
Instrument Corporation
65 Madison Avenue
New York, N. Y.

SPECTRA DEMONSTRATORS
Baird Associates
Central Scientific Co.
Eastern Science Co.
Fuess, Inc.
Gaertner Scientific Corp.

SPECTRAL TUBES CONTAINING RARE GASES (See Spectrum Tubes)

SPECTROGRAPHS
Akatos, Inc.
Baird Associates
Bausch & Lomb Optical
Bryden Co.
Gaertner Scientific Corp.
Spencer Lens Co.
Zeiss, Inc., Carl

SPECTROGRAPHS, Diffraction Grating
Applied Research Labs.
Baird Associates

SPECTROGRAPHS, Oscillating
Hayes Scientific App.

SPECTROGRAPHS, Vacuum
Central Scientific Co.
Dietert Co.
Fecker, J. W.
Fuess, Inc.
Jarrell-Ash Co.

SPECTROGRAPHS, X-ray
Central Scientific Co.
Fuess, Inc.
Gaertner Scientific
General Electric X-Ray
Hayes Scientific App.
Jarrell-Ash Co.
Kelley-Koett Mfg.

SPECTROMETERS
Akatos, Inc.
American Askania Corp.
Bausch & Lomb Optical
Fuess Inc.
Jarrell-Ash Co.
Spencer Lens Co.

SPECTROMETER, Infra-Red
Gaertner Scientific Corp.

SPECTROMETERS, X-RAY (See Spectographs, X-Ray)

SPECTRO-PHOTOMETERS (See Photometers, Spectro)

SPECTROSCOPES
Akatos, Inc.
American Askania Corp.
Bausch & Lomb Opt.
Fuess, Inc.
Gaertner Scientific Corp.
Laboratory Specialties
Leitz, Inc.
Spencer Lens Co.

SPECTROSCOPE, Quartz
Gaertner Scientific Corp.

SPECTROSCOPES, Stellar
Am. Telescope Labs.
Central Scientific Co.
Eastern Science Co.
Fecker, J. W.
Mico Instrument Co.
Perkins-Elmer Corp.
Zeiss, Inc., Carl

SPECTRUM TUBES
Central Scientific Co.
Fuess, Inc.
Gaertner Scientific Corp.
General Physical Lab.
Jarrell-Ash Co.

SPEED, Indicators
Amthor Testing Inst. Co.
Bailey Meter Co.
Biddle Co., Jas. G.
Boulin Instrument Corp.
Brown Inst. Co.
Commercial Engg. Labs.
Consol. Ashcroft Hancock
Cramer & Co., Inc.
Electric Speed Ind. Co.
Elec. Tachometer Corp.
Esterline-Angus Co.
Foxboro Co.
Gaertner Scientific Corp.
General Elec. Co.
Hasler-Tel Co.
Hathaway Inst. Co.
Hickok Elec. Inst. Co.
Jaeger Watch Co.
Leeds & Northrup Co.
Martin Decker Corp.
McDonnell Odometer Co.
Moisture Register Co.
Pioneer Instrument
Precision Therm. & Inst.
(Cont'd)

SPEED, Indicators (Continued)
Scherr Co., Inc.
Sound Apparatus Co.
Starrett Co.
Sticht & Co.
Veeder-Root, Inc.
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.
Zernickow Co., O.

SPEED, Recorders (See Speed Indicators)

SPEED, Regulators (See Controllers, Automatic, Tachometric)

SPEED SYNCHRONIZING INDICATORS
Electric Speed Ind. Co.

SPEEDOMETERS
Boulin Instrument Corp.
Central Scientific Co.
Corbin Screw Corp.
Cramer & Co., Inc.
Elec. Tachometer Corp.
General Elec. Co.
Knopf, Paul
Stewart-Warner Corp.
Westinghouse Elec. & Mfg.

SPHEROMETERS
American Askania Corp.
Central Scientific Co.
Ferner Co.
Fish-Schurman Co.
Fuess, Inc.
Gaertner Scientific Corp.
Merkle Korff Gear
Seiss Co., Inc.
Welch Scientific Co.

SPHYGMOMANOMETERS
Cambridge Inst. Co.
Central Scientific Co.
Hellige, Inc.
Taylor Inst. Cos.

SQUARES, Combination & Machinists'
Brown & Sharpe
Lufkin Rule Co.
Mico Instrument Co.
Starrett Co.
Union Tool Co.
Warren-Knight Co.

STANDARD CELLS (See Cells, Standard)

STANDARDS, Capacitance
Cambridge Inst. Co.
General Radio Co.
Industrial Instruments
Leeds & Northrup Co.
Rubicon Co.
Solar Mfg. Corp.

STANDARDS, Color
Fish-Schurman Co.
Hellige, Inc.
Munsell Color Co.
Tagliabue Mfg. Co.

STANDARDS E.m.f.
Cambridge Inst. Co.
Leeds & Northrup Co.
Rubicon Co.

STANDARDS, Frequency
Andrew, Victor J.
Ferris Inst. Corp.
General Radio Co.

STANDARDS, Inductance
Cambridge Inst. Co.
General Radio Co.
Leeds & Northrup Co.
Rubicon Co.

STANDARDS, Length
Gaertner Scientific Corp.
Gurley, W. & L. E.
Van Keuren Co.

STANDARDS, Mass
Gurley, W. & L. E.
Seederer-Kohlbusch, Inc.

STANDARDS, Potential
Leeds & Northrup Co.
Rubicon Co.

STANDARDS, Pressure
Green, Henry J.
Precision Therm. & Inst.

STANDARDS, Resistance
Beck Bros.
Cambridge Inst. Co.
General Radio Co.
International Resistance
Leeds & Northrup Co.
Rubicon Co.
Shallcross Mfg. Co.
Sticht & Co.
Ward Leonard Elec. Co.

STANDARDS, Sound Level
General Radio Co.

STANDARDS, Temperature
Green, Henry J.
Leeds & Northrup Co.
Moeller Instrument Co.
Precision Therm. & Inst.
Tagliabue Mfg. Co.

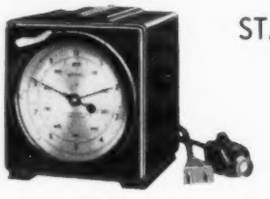
STANDARDS, Time
Gaertner Scientific Corp.
General Radio Co.
Standard Elec. Time Co.

STANDARDS, Volume
Gurley, W. & L. E.

STARTERS, MOTOR
Allen-Bradley Co.
Allis-Chalmers Mfg. Co.
Cutler-Hammer, Inc.
Eclipse Aviation
General Elec. Co.
Monitor-Controller Co.
Penn Electric Switch Co.
Schaefer Bros. Co.
Ward Leonard Elec. Co.

STATION CONTROL EQUIPMENT
Allis-Chalmers Mfg. Co.
American Meter Co.
Area Regulators, Inc.
Elec. Indicator Corp.
General Elec. Co.

Better than a Stop Watch



STANDARD ELECTRIC
STOP CLOCK

Dial diameter is 3-3/16" for easy reading.

Accuracy per interval timed is to within .02 seconds on slow-speed models and to within .005 seconds on fast models. For superlatively accurate work the timing circuit can be wired to and controlled by automatic contacts on your test apparatus.

Comes mounted in a bakelite case or on a steel panel for building into your test apparatus.

Resetting to zero is instantaneous.

Guaranteed for one year, renders long service. Six standard models with different speeds and dial scales, also three 10" dial wall models.

Prices $35.00 to $70.00. Ask for Bulletin 108. Write Dept. G.

THE STANDARD ELECTRIC TIME COMPANY
Springfield, Mass.... Branch Offices in Principal Cities
"STANDARD MAKES EVERY SPLIT-SECOND COUNT"

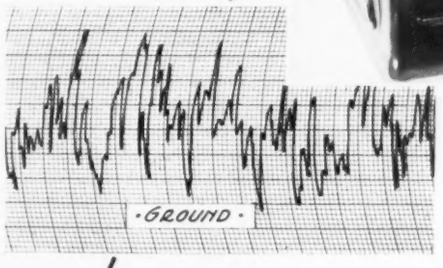
For addresses, see pages 66-76

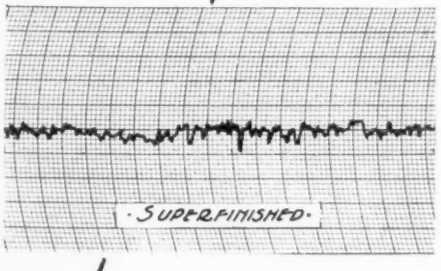
The BRUSH SURFACE ANALYZER

accurate

simple

fast





"Topographic" Profile of finished surfaces . . . actual height above and depth below mean reference level in **Millionths** of an **Inch** in finished metals, glass, plastics, paper, etc.

Immediate and **Permanent** ink-on-paper record.

Tracer method of recording . . . surface under test explored by fine diamond point the vertical motion of which is amplified up to 60,000 times in the corresponding pen motion on moving paper chart.

Utmost Simplicity of operation . . . readily set up in shop or laboratory for production or research by simply plugging into 110 volt 60 cycle power supply.

Portable and **Rugged** . . . easily transportable in carrying cases in which instrument may be operated.

THE BRUSH DEVELOPMENT CO.
3311 PERKINS AVENUE • • • • CLEVELAND, OHIO

MICRO SWITCH

For Precise Snap Action On Instruments—Gauges

Instrument manufacturers that require switches to be actuated by temperature, pressure, or cams, will find the supersensitive, quick snap-action make-and-break of the Micro Switch useful for their applications. The Micro Switch has found its place on thermostats, timers, meters, and gauges.

Where the available operating energy is small, the Micro Switch, with differential energy requirements as small as .0003 ounce inches, is useful.

It occupies a space of only $\frac{1}{2}$" x $\frac{27}{32}$" x $1\frac{1}{16}$" without actuators or metal housings.

The Micro Switch is furnished single pole only, with normally closed, normally open, or double throw contact arrangements, and is listed by Underwriters' Laboratories at 1200 watts up to 600 volts A.C.

Copyright 1941, Micro Switch Corporation

Actual Size: $1\frac{1}{2}$"x$1\frac{1}{16}$"x$1\frac{1}{16}$"

PANEL MOUNT

- Operating Pressure—7-9 oz.
- Movement differential — Under .0005".
- Overtravel—$\frac{7}{32}$".
- For mounting on panels up to $\frac{3}{8}$" thickness.
- Useful for push button or mechanical actuation.
- List price —$2.59 for double throw.

MICRO SWITCH is the Name of a Particular Product, Not a General Term

TRADE MICRO MS MARK SWITCH

Manufactured in FREEPORT, Illinois, by Micro Switch Corporation

Sales Offices . . . . . New York . . . . . Chicago . . . . . Boston

NEW

5-RANGE UNIVERSAL TYPE HAND TACHOMETERS

Accurate—direct reading—dead beat —large 3" dial, wide open scales, easy to read—4 models covering all speeds from 30 to 48000 RPM.

Write for New Bulletin No. 750

Herman H. Sticht Company, Inc.

27 Park Place, New York

ELECTRIC TACHOMETERS

Portable Tachometer

Multi-range indicator and generator combined in compact hand piece for general shop use.

Conventional Types

For permanent installation. Calibrated to suit your requirements. LOW COST widens field of application.

Bulletins on request

THE WINSLOW COMPANY

NINE LIBERTY STREET NEWARK, N. J.

STEAM METERS (See Flow Meters, Steam)
STEEL TAPES (See Tapes, Steel)
STELLAR SPECTROSCOPES (See Spectroscopes, Stellar)
STEREOSCOPES, X-Ray
Bausch & Lomb Optical
Kelley-Koett Mfg. Co.
Westinghouse X-Ray Co.
STETHOSCOPES, ENGINEERS
Brush Development Co.
Test-A-Tone Co.
STIFFNESS TESTERS, PAPER (See Tester, Stiffness, Paper)
STILLS, AUTOMATIC WATER
Barnstead Still & Steril.
Central Scientific Co.
Fish-Schurman Co.
Specialty Glass Co.
Weber Bros. Metal Works
STIRRERS, LABORATORY, Variable Speed
Eastern Engg. Co.
STOP WATCHES (See Watches, Stop)
STRAIGHT EDGES
Brown & Sharpe
Dietzen Co.
Ford Motor Co.
Keuffel & Esser Co.
George Scherr Co.
Soltmann, Inc.
Speidel & Co.
Warren-Knight Co.
White Co. Inc.
STRAIGHTENING VANES
Robinson Orifice Fitting
STRAIN GAGES (See Gages, Strain)
STRAIN TESTERS, GLASS (See Testers, Strain (Glass)
STRAIN-TIME RECORDERS
Baldwin-Southwark Corp.
Cambridge Inst. Co.
STREAM GAGING INSTRUMENTS
Gurley, W. & L. E.
Keuffel & Esser Co.
Morey & Jones, Ltd.
STRESS INDICATORS
Ames Co., B. C.
Baldwin-Southwark Corp.
Cambridge Inst. Co.
Martin Decker Corp.
Riehle Div.
STRESS-STRAIN, Indicators
Ames Co., B. C.
Baldwin-Southwark Corp.
STRESS-STRAIN, Recorders
Baldwin-Southwark Corp.
Cambridge Inst. Co.
Olsen Testing Machine
Riehle Div.
STROBOSCOPES
Boulin Inst. Corp.
Commercial Engg. Labs.
L. A. B. Corp.
Pioneer Instrument
Welch Mfg. Co.
Westinghouse Elec. & Mfg.
Zeiss, Inc., Carl
SULPHUR BOMBS (See Bombs, Sulphur)
SULPHUR DIOXIDE, Indicators (See Gas Analyzers, Sulphur Dioxide) **Recorders** (See Gas Analyzers, Sulphur Dioxide)
SUNSHINE, Indicators & Recorders
Cambridge Inst. Co.
Esterline-Angus Co.
Friez & Sons
Fuess, Inc.
G. M. Mfg. Co., Inc.
Leeds & Northrup
Luxtrol Co., Inc.
Taylor Inst. Cos.
White Co. Inc.
SUPERVISORY CONTROL EQUIPMENT
American Automatic Elec.
Autocall Co.
Bristol Co.
Cramer & Co., Inc.
General Elec. Co.
Guardian Elec. Mfg. Co.
Leeds & Northrup Co.
Tagliabue Mfg. Co.
SURFACE FINISH TESTERS
Brush Development Co.
Physicists Research
SURFACE GAGES (See Gages, Surface)
SURFACE PLATES, GLASS
Bausch & Lomb Optical
Clark & Sons
Fecker, J. W.
Fish-Schurman Co.
Zeiss, Inc., Carl
SURGE CREST AMMETERS (Ammeters, Surge-Crest)
SURGE, Indicators & Recorders
Elec. Indicator Corp.
General Elec. Co.
Esterline-Angus Co.
SURVEYING INSTRUMENTS
Alpha Instrument Co.
Beckman Co.
Berger & Sons
Bliss & Co.
Bostrom-Brady
Dietzen Co.
Goldak Co.
Gurley, W. & L. E.
Kenyon Instrument Co.
Kern Co.
Keuffel & Esser Co.
Kolesch & Company
Leupold, Volpel & Co.
Pittsburgh Inst. & Mach.
Post Co., Frederick
Speedometer Electric Co.
Speidel & Co.
J. C. Ulmer Co.
United States Blue Print
Warren-Knight Co.
Weber Co.
White Co. Inc.
Zeiss, Inc., Carl
SURVEYING INSTRUMENTS, Aneroids
Am. Paulin System
SURVEYING INSTRUMENTS, Underground, for wells or bore holes
H. Cole Co.
Driftmeters, Inc.
Engineering Labs., Inc.
Geophysical Inst. Co.
Halliburton Oil Well
Ruska & Co.
Sperry-Sun Well Survey.
Warren-Knight Co.
David White Co. Inc.
SURVEYOR'S CHAINS (See Surveying Instruments)
SWITCHES, Air-operated
Detroit Lubricator Co.
Johnson Service Co.
Shallcross Mfg. Co.
Tagliabue Mfg. Co.
SWITCHES, Automatic Transfer
Allen-Bradley Co.
Anderson, A. & J. M.
Arrow-Hart & Hegeman
Autocall Co.
Automatic Switch Co.
Cramer & Co., Inc.
Cutler-Hammer, Inc.
General Elec. Co.
Hart Mfg. Co.
Monitor Controller Co.
Ward Leonard Elec. Co.
Zenith Electric Co.
SWITCHES, Instrument
Autocall Co.
Furnas Electric Co.
General Elec. Co.
J-B-L Inst. Co.
Kellogg Switchboard
Micro Switch Corp.
Rubicon Co.
Sensitive Research Inst.
Thwing-Albert Instrument
Triplett Elec. Inst. Co.
United States Inst. Corp.
Weston Elec. Inst. Corp.
SWITCHES, Magnetic
Allen-Bradley Co.
Arrow-Hart & Hegeman
Autocall Co.
Automatic Switch Co.
Cutler-Hammer, Inc.
General Elec. Co.
Guardian Elec. Mfg. Co.
Hart Mfg. Co.
Industrial Engr. Corp.
Monitor Controller Co.
Penn Electric Switch
Perfex Corp.
Struthers-Dunn
Ward Leonard Elec. Co.
Zenith Electric Co.
SWITCHES, Mercury
Arrow-Hart & Hegeman
Continental Elec. Co.
Elec. Switch Corp.
Frederick, George
General Elec. Co.
Gen. Elec. Lamp Dept.
Hart Mfg. Co.
Minneapolis-Honeywell
SWITCHES, Pyrometer
J-B-T Insts. Inc.
Lewis Engg. Co.
Tagliabue Mfg. Co.
Thwing-Albert Inst. Co.
Weston Elec. Inst. Corp.
Woermann-Schuchhardt
SWITCHES, Relay
Allen-Bradley Co.
Andrew, Victor J.
Amer. Automatic Elec.
Arrow-Hart & Hegeman
Autocall Co.
Automatic Switch Co.
Cutler-Hammer, Inc.
Eclipse Aviation
Edison Electrical Controls
Friez & Sons
General Controls Co.
General Elec. Co.
Guardian Elec. Mfg. Co.
Hart Mfg. Co.
Industrial Engr. Corp.
Kellogg Switchboard
Monitor Controller Co.
Penn Electric Switch
Perfex Corp.
Standard Elec. Prods.
Struthers-Dunn
Ward Leonard Elec. Co.
Zenith Electric Co.
SWITCHES, Rotary
Amer. Automatic Elec.
Arrow-Hart & Hegeman
Autocall Co.
Furnas Electric Co.
General Elec. Co.
Guardian Elec. Mfg. Co.
Hart Mfg. Co.
Lewis Engg. Co.
Rubicon Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
Tagliabue Mfg. Co.
Thwing-Albert Inst. Co.
Triplett Electrical Inst.
Weston Elec. Inst. Corp.
SWITCHES, Snap
Arrow-Hart & Hegeman
Cutler-Hammer, Inc.
General Elec. Co.
Hart Mfg. Co.
McDonnell & Miller
Micro Switch Corp.
Minneapolis-Honeywell
Perfex Corp.
Ward Leonard Elec. Co.
SWITCHES, Thermostatic
Advance Electric Co.
Allen-Bradley Co.
Burling Instrument Co.
Cook Electric Co.
Detroit Lubricator Co.
Dunn, Inc., Struthers
Edison Electrical Controls
Friez & Sons
Gleason-Avery, Inc.
Guardian Electric
Hart Manufacturing Co.
Minneapolis-Honeywell
Penn Electric Switch Co.
Perfex Corp.
Shallcross Mfg. Co.
Spencer Thermostat Co.
Tagliabue Mfg. Co., C. J.
Ulanet Co., George
Ward Leonard Electric Co.
SWITCHES, Time
American Timer Corp.
Anderson, A. & J. M.
Autocall Co.
Automatic Elec. Mfg.
Bacon, Emra D.
Cramer & Co., Inc.
Eagle Signal Corp.
Edison Electrical Controls
Frober-Faybor Co.
General Elec. Co.
Guardian Elec. Mfg. Co.
Industrial Engr. Corp.
Industrial Instrument Co.
Landis & Gyr. Inc.
Minneapolis-Honeywell
Paragon Electric Co.
Penn Electric Switch
Perfex Corp.
Rhodes, Inc., M. H.
Sangamo Electric Co.
States Co.
Thomas Clock Co., Seth
Thompson Clock Co.
Wadsworth Elec. Mfg. Co.
Walser Automatic Timer
Ward Leonard Elec. Co.
Zenith Electric Co.
SYNCHRONIZATION FORKS. Electrical (See Forks, Synchronization)
SYNCHRONOUS MOTORS (See Motors, Synchronous)
SYNCHROSCOPES
Allis-Chalmers Mfg. Co.
Eclipse Aviation
Electric Controller
General Elec. Co.
Hickok Elec. Inst. Co.
Kollsman Inst. Co.
Roller-Smith Co.
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.
TACHOGRAPHS
Amthor Testing Inst.
Biddle Co., Jas. G.
Coats Mach. Tool Co.
Cramer & Co., Inc.
Ohmer Register Co.
Zeiss, Inc., Carl
Zernickow Co., O.
TACHOMETER TESTERS (See Testers, Tachometer)
TACHOMETERS, Centrifugal
Amthor Testing Inst. Co.
Barbour Stockwell Co.
Biddle Co., Jas. G.
Boulin Instrument Corp.
Coats Mach. Tool Co.
Consol. Ashcroft Hancock
Corbin Screw Corp.
Durant Mfg. Co.
Elec. Tachometer Corp.
Foxboro Co.
Hays Corp.
Jones Motrola Sales
Knopf, Paul
Kollsman Inst. Co.
Pioneer Instrument Co.
Scherr Co., Inc.
Stewart-Warner Corp.
Sticht & Co.
Veeder-Root, Inc.
Viking Instrument Co.
Zernickow Co., O.
TACHOMETERS, Chronometric
Amthor Testing Inst.
Biddle Co., Jas. G.
Boulin Instrument Corp.
Coats Mach. Tool Co.
Cramer & Co., Inc.
Elec. Tachometer Corp.
Elgin Nat'l Watch Co.
Hasler-Tel Co.
Jaeger Watch Co.
Pierce Watch Co.
Scherr Co., Inc.
Standard Elec. Time
Sticht & Co.
Stover-Lang Co.
Zernickow Co., O.
TACHOMETERS, Cross-pendulum
Amthor Testing Inst.
Biddle Co., Jas. G.
Coats Mach. Tool Co.
Sticht & Co.
Zernickow Co., O.
TACHOMETERS, Electric
Bristol Co.
Brown Inst. Co.
Electric Speed Ind. Co.
Elec. Tachometer Corp.
Esterline-Angus Co.
Foxboro Co.
General Elec. Co.
Hathaway Inst. Co.
Hickok Elec. Inst. Co.
Hy-Ef Electrical Prod.
(Cont'd)

For addresses, see pages 66-76

TACHOMETERS, Electric (Continued)
Jaeger Watch Co.
J-B-T Instruments
Jones Motrola Sales
Kollsman Inst. Co.
Lantz-Phelps Corp.
Martin Decker Corp.
Moisture Register Co.
National Instrument Co.
Pioneer Instrument Co.
Pitometer Log Corp.
Potter Co.
Scherr Co., Inc.
Westinghouse Elec & Mfg.
Weston Elec. Inst. Corp.
Winslow Co.
Zip Abrasive Co.

TACHOMETERS, Electro-magnetic
Cummings Mach. Works
Jaeger Watch Co.
Kollsman Inst. Co.
National Instrument Co.
Pioneer Instrument
Standard Elec. Time Co.
Stewart-Warner Corp.
Zernickow Co., O.

TACHOMETERS, Fly-ball
Biddle Co., Jas. G.
Coats Mach. Tool Co.
Elec. Tachometer Corp.
Jones Motrola Sales
Sticht & Co.
Viking Instrument Co.

TACHOMETERS, Portable
Amthor Testing Inst. Co.
Biddle Co., Jas. G.
Boulin Instrument Corp.
Consol. Ashcroft Hancock
Corbin Screw Corp.
Elec. Tachometer Corp.
Foxboro Co.
Hasler-Tel Co.
Jones Motrola Sales
Martindale Electric Co.
Rieker Instrument Co.
Sticht & Co.
Viking Instrument Co.
Zernikow Co.

TACHOMETERS, Speed Limit Control
Barbour Stockwell Co.

TACHOMETERS, Stroboscopic
Boulin Instrument Corp.
Coats Mach. Tool
General Radio Co.
L. A. B. Corp.
Stewart-Warner Corp.

TACHOMETERS, Tilting-ring
Amthor Testing Inst. Co.
Coats Mach. Tool Co.
Zernikow Co.

TACHOMETERS, Vibrating Reed
Biddle Co., Jas. G.

TACHOSCOPES
Amthor Testing Inst. Co.
Biddle Co., Jas. G.
Scherr Co., Inc.
Sticht & Co.
Zernickow Co., O.

TAFFRAIL LOGS; SHIP
Bliss & Co.

TANGENT METERS (See Meters, Tangent)

TAPE STRETCHER APPARATUS
Ballauf Mfg. Co.

TAPES, Oil Gauger's
Keuffel & Esser Co.

TAPES, Steel
Dietzen Co.
Keuffel & Esser Co.
Lufkin Rule Co.
Soltmann, Inc.
Speidel & Co.
Starrett Co.
United States Blue Print
Warren-Knight Co.
Weber Co.
White Co., Inc.

TAPES, Surveyor's (See Surveying Instruments)

TAXI METERS
Knopf, Paul
Ohmer Register Co.
Pittsburgh Taximeter Co.

TELEMETERING SYSTEMS (See Remote Metering)

TELEMETERS (Surveying & Military—Optical)
Kern Co.
Kollmorgen Optical Co.
Keuffel & Esser Co.
Pierce Watch Co.

TELESCOPES, Alignment
Am. Telescope Labs.
Fecker, J. W.
Gen. Engg. & Model
Keuffel & Esser Co.
Kollmorgen Optical Co.
Perkin-Elmer Corp.
Scherr Co., Inc.
Unertl, John
White Co. Inc.

TELESCOPES, Astronomical
Am. Telescope Labs.
Bausch & Lomb Opt.
Clark & Sons
Eastern Science Co.
Fecker, J. W.
Gaertner Scientific Corp.
Kern Co.
Mico Instrument Co.
Perkin-Elmer Corp.
Tinsley Labs.
Unertl, John
Zeiss, Inc., Carl

TELESCOPES, Azimuth
Am. Telescope Labs.
Clark & Sons
Fecker, J. W.
Gaertner Scientific Corp.
Kern Co.
Kollmorgen Optical Co.
Perkin-Elmer Corp.
Tinsley Labs.
Unertl, John
Warner & Swasey Co.
Zeiss, Inc., Carl

TELESCOPES, Bore, Inspection
Am. Telescope Labs.
Gen. Engg. & Model Wks.
Kollmorgen Optical Co.
Lenox Inst. Co.
Perkin-Elmer Corp.
Scherr Co., Inc.
Unertl, John
Zeiss, Inc., Carl

TELESCOPES, Laboratory
Gaertner Scientific Corp.

TELESCOPES, Reflecting
Am. Telescope Labs.
Clark & Sons
Fecker, J. W.
Fish-Schurman Co.
Perkin-Elmer Corp.
Tinsley Labs.
Unertl, John
Warner & Swasey Co.
Zeiss, Inc., Carl

TELESCOPES, Refracting
Am. Telescope Labs.
Bausch & Lomb Opt.
Clark & Sons
Fecker, J. W.
Fish-Schurman Co.
Kern Co.
Keuffel & Esser Co.
Perkin-Elmer Corp.
Tinsley Labs.
Unertl, John
Warner & Swasey Co.
Wollensak Optical Co.
Zeiss, Inc., Carl

TELESCOPES, Zenith
American Askania Corp.
Am. Telescope Labs.
Clark & Sons
Fecker, J. W.
Gaertner Scientific Corp.
Kern Co.
Perkin-Elmer Corp.
Unertl, John
Zeiss, Inc., Carl

TENSIOMETERS
Boulin Instrument Corp.
Central Scientific Co.
Geophysical Inst. Co.
Olsen Testing Machine
Suter, Alfred
Thwing-Albert
Toledo Scale Co.

TENSION INDICATORS
Martin Decker Corp.
Pacific Scientific Co.
Seederer-Kohlbusch, Inc.

TENSION INDICATORS, Textile
Boulin Instrument Corp.

TEST BLOCKS
Detroit Testing Mach. Co.
Ford Motor Co.
Meter Devices Co.
Steel City Testing Lab.
Van Keuren Co.

TEST INDICATOR
Deming Indicator Co.

TEST WEIGHTS (See Weights Test)

TEST WELLS
Palmer Co.

TESTERS, Tachometer
Rieker Inst. Co.

TESTERS & TESTING MACHINES (See also object of measurement and control)

TESTERS & TESTING MACHINES, Abrasion
American M. A. N. Corp.
Amthor Testing Inst. Co.
Atlas Elec. Devices Co.
Fidelity Mach. Co.
Morehouse Machine Co.
Olsen Testing Machine
Riehle Div.
Saxl Inst. Co.
Scott Co., Henry L.
Shawmut Engineering Co.
Suter, Alfred
Taber Instrument Co.
Testing Machines, Inc.
Welch Engineering Co.
Zuhr, Inc., Henry

TESTERS & TESTING MACHINES, Absorption
Gurley, W. & L. E.

TESTERS & TESTING MACHINES, Air Speed Indicator (See Air-speed Indicator Testers)

TESTERS & TESTING MACHINES, Alternating Stress
American M. A. N. Corp.
Brush Development Co.
Emery Co.
Krouse Fatigue Machine
Olsen Testing Machine
Riehle Div.
Suter, Alfred

TESTERS & TESTING MACHINES, Altimeter (See Altimeter Testers)

TESTERS & TESTING MACHINES, Armature
Ideal Commutator Dresser

TESTERS & TESTING MACHINES, Asphalt
American Inst. Co.
Atlas Electric Devices
Brabender Corp.
Braun Corp.
Central Scientific Co.
Chatillon & Sons
Exact Weight Scale
Fish-Schurman Co.
Fisher Scientific Co.
Humboldt Mfg. Co.
Philadelphia Thermometer
Precision Scientific Co.
Riehle Div.
Tagliabue Mfg. Co.
Victor Equipment Co.
Western Machinery Co.

TESTERS & TESTING MACHINES, Axle
Sperry Products, Inc.

TESTERS & TESTING MACHINES, Ball Bearing (See Testers, Bearing)

TESTERS & TESTING MACHINES, Battery
Burton-Rogers Co.
Clough-Brengle Co.
Hickok Elec. Inst. Co.
Hy-Ef Electrical Prods.
Instrument Specialties Co.
Lantz-Phelps Corp.
Lundquist Tool & Mfg.
Precision Therm. & Inst.
Rascher & Betzold
Rieker Inst. Co.
Ruth Glass Division
Testrite Instrument Co.
Weston Elec. Inst. Corp.

TESTERS & TESTING MACHINES, Beating
Brabender Corp.
Green, Arthur B.
Williams Apparatus Co.

TESTERS & TESTING MACHINES, Bearing
American M. A. N. Corp.
Olsen Testing Machine
RCA Manufacturing Co.
Suter, Alfred

TESTERS & TESTING MACHINES, Bending
American M. A. N. Corp.
Dorr-Patterson Engr.
Hayes Scientific App.
Olsen Testing Machine
Holz, Herman A.
Morehouse Machine Co.
Riehle Div.
Saxl Inst. Co.
Steel City Testing Lab.
Suter, Alfred
Taber Instrument Co.
Testing Machines, Inc.

TESTERS & TESTING MACHINES, Brake
American Inst. Co.
Clough-Brengle Co.
Commercial Engg. Labs.
Cramer & Co., Inc.

TESTERS & TESTING MACHINES, Brinell
Detroit Testing Mach.
Ferner Co.
Olsen Testing Machine
Pittsburgh Inst. & Mach.
Riehle Div.
Steel City Testing Lab.
Suter, Alfred
Testing Machines, Inc.

TESTERS & TESTING MACHINES, Brittleness
Baldwin-Southwark Corp.
Riehle Div.
Saxl Instr. Co.

TESTERS & TESTING MACHINES, Bursting
Perkins & Son, Inc.
Scott Co., Henry L.
Suter, Alfred
Testing Machines, Inc.

TESTERS & TESTING MACHINES, Cable
Amthor Testing Inst.
Atlas Electric Devices
Boulin Instrument Corp.
General Elec. Co.
Leeds & Northrup Co.
Martin Decker Corp.
Olsen Testing Machine
Riehle Div.
Scott Co., Henry L.
Shallcross Mfg. Co.
Suter, Alfred

TESTERS & TESTING MACHINES, Cement
American Inst. Co.
Baldwin-Southwark Corp.
Central Scientific Co.
Emery Co.
Exact Weight Scale Co.
Federal Pneumatic Sys.
Fisher Scientific Co.
Hayes Scientific App.
Humboldt Mfg. Co.
Olsen Testing Machine
Precision Scientific Co.
Refinery Supply Co.
Riehle Div.
Scientific Inst. Co.
Scott Co., Henry L.
Sodemann Heat & Power
Suter, Alfred
Western Machinery Co.

TESTERS & TESTING MACHINES, Chain
Detroit Testing Machine
Riehle Div.

TESTERS & TESTING MACHINES, Chlorine
Rushnell & Nevins
(Cont'd)

TESTING MACHINES, Chlorine (Cont'd)
Everson Mfg. Co.
Hellige, Inc.
Industrial Inst. Inc.
Rascher & Betzold
Taylor & Co., Inc.
Wallace & Tiernan

TESTERS & TESTING MACHINES, Coal (See Fuel below)

TESTERS & TESTING MACHINES, Coil (Electric)
Boonton Radio Corp.
Clough-Brengle Co.
Ideal Commutator Dresser
Industrial Insts. Inc.
Rubicon Co.

TESTERS & TESTING MACHINES, Color
Atlas Electric Devices Co.
Eimer & Amend
Fisher Scientific Co.
Gaertner Scientific Corp.
Luztrol Co., Inc.
Tagliabue Mfg. Co.

TESTERS & TESTING MACHINES, Compression
American M. A. N. Corp.
Baldwin-Southwark Corp.
Dorr-Patterson Engr. Co.
Emery Co.
Exact Weight Scale Co.
Ferner Co.
Olsen Testing Machine
Perkins & Son, Inc.
Potter Co.
Riehle Div.
Scott Co., Henry L.
Steel City Testing Lab.
Suter, Alfred
Toledo Scale Co.

TESTERS & TESTING MACHINES, Concrete (See Cement above)

TESTERS & TESTING MACHINES, Condenser
Aerovox Corp.
Clough-Brengle Co.
Electronic Design Corp.
Industrial Insts. Inc.
Jackson Electrical Inst.
Potter Co.
RCA Manufacturing Co.
Tobe Deutschmann Corp.
Triplett Electrical Inst.
Weston Elec. Inst. Corp.

TESTERS & TESTING MACHINES, Creep
Gaertner Scientific Corp.
Instrument Specialties Co.
Olsen Testing Machine
Riehle Div.
Suter, Alfred

TESTERS & TESTING MACHINES, Damping
American M. A. N. Corp.
Baldwin-Southwark Corp.

TESTERS & TESTING MACHINES, Deflection, Light Wave
Gaertner Scientific Corp.
Van Keuren Co.

TESTERS & TESTING MACHINES, Dew Point
General Electric
Refinery Supply Co.

TESTERS & TESTING MACHINES, Diaphragms
Instrument Specialties

TESTERS & TESTING MACHINES, Dielectric Properties
American Transformer Co.
Associated Research, Inc.
Leeds & Northrup Co.
Miller Co., B. F.
Roller-Smith Co.

TESTERS & TESTING MACHINES, Ductility
Central Scientific Co.
Detroit Testing Mach.
Humboldt Mfg. Co.
Olsen Testing Machine
Riehle Div.
Saxl Inst. Co.
Scott Co., Henry L.
Steel City Testing Lab.
Suter, Alfred

TESTERS & TESTING MACHINES, Electroplating (See Electroplating Solution Testing Apparatus)

TESTERS & TESTING MACHINES, Emulsion & Demulsibility
Central Scientific Co.
Eimer & Amend

TESTERS & TESTING MACHINES, Expansion
Brabender Corp.
Exact Weight Scale Co.
Ferner Co.
Gaertner Scientific Corp.

TESTERS & TESTING MACHINES, Fatigue
American M. A. N. Corp.
Baldwin-Southwark Corp.
Emery Co.
Ferner Co.
Hathaway Inst. Co.
Hays Scientific App.
Krouse Fatigue Mach.
Olsen Testing Machine
Raytheon Mfg. Co.
Riehle Div.
Saxl Inst. Co.
Scott Co., Henry L.
Suter, Alfred
Testing Machines, Inc.
Zuhr, Inc., Henry

For addresses, see pages 66-76

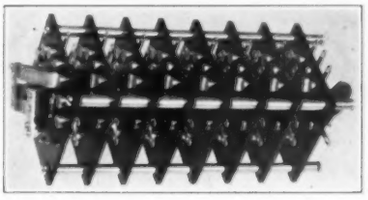
J-B-L INSTRUMENT CO.

Manufacturers of

ROTARY SWITCHES

for

INSTRUMENT, ELECTRICAL AND INDUSTRIAL APPLICATIONS



Low and positive contact resistance, indexing mechanism, multi-deck, multi-contact, shorting, non-shorting, rugged and dependable.

Submit Your Switch Problem

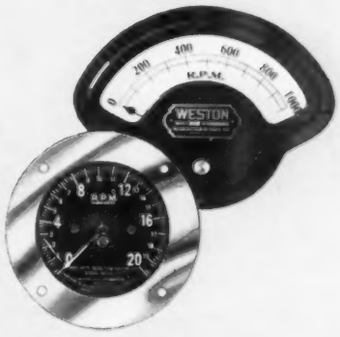
A letter describing your switch problem will bring specifications and quotation promptly.

Write for Bulletin

J-B-L INSTRUMENT CO.

P. O. BOX 135, DARBY, PA.

ELECTRICAL TACHOMETERS



Quickly installed simply by wiring indicator to magneto. No flexible shafting employed. Indicators can be calibrated in RPM or other units. Several indicators can be connected to one magneto and mounted wherever desired. Widely used on pumping and conveyor systems, ovens, kilns, etc. Bulletin available. Weston Electrical Instrument Corporation, 591 Frelinghuysen Ave., Newark, New Jersey.

WESTON *Instruments*

TESTERS & TESTING MACHINES, Flash Point, Abel's
Central Scientific Co.
Ruehfel Co.

TESTERS & TESTING MACHINES, Flash Point, Abel-Pensky's (See Abel's above)

TESTERS & TESTING MACHINES, Flash Point, Cleveland Open Cup
American Inst. Co.
Boekel & Co.
Central Scientific Co.
Eimer & Amend
Humboldt Mfg. Co.
Olsen Testing Machine
Precision Scientific Co.
Ruehfel Co.
Tagliabue Mfg. Co.

TESTERS & TESTING MACHINES, Flash Point, Elliott Closed Cup
American Inst. Co.
Central Scientific Co.
Humboldt Mfg. Co.
Precision Scientific Co.
Ruehfel Co.
Tagliabue Mfg. Co.

TESTERS & TESTING MACHINES, Flash Point, Pensky-Martens
Boekel & Co.
Central Scientific Co.
Humboldt Mfg. Co.
Precision Scientific Co.
Ruehfel Co.
Tagliabue Mfg. Co.

TESTERS & TESTING MACHINES, Flash Point, Tag Closed
Central Scientific Co.
Humboldt Mfg. Co.
Precision Scientific Co.
Ruehfel Co.
Tagliabue Mfg. Co.

TESTERS & TESTING MACHINES, Flatness, Light Wave
Baird Associates
Fecker, J. W.
Fish-Schurman Co.
Gaertner Scientific Co.
Scherr Co., Inc.
Van Keuren Co.
Zeiss, Inc., Carl

TESTERS & TESTING MACHINES, Folding Endurance (Paper)
American Inst. Co.
Amthor Testing Inst. Co.
Olsen Testing Machine
Saxl Inst. Co.
Suter, Alfred
Testing Machines, Inc.
Thwing-Albert Inst. Co.

TESTERS & TESTING MACHINES, Freeness
Dietert Co.
Green, Arthur B.
Testing Machines, Inc.
Williams Apparatus Co.

TESTERS & TESTING MACHINES, Fuel
Brabender Corp.
Burrell Technical Supply
Central Scientific Co.
Emerson Apparatus Co.
Fish-Schurman Co.
Fisher Scientific Co.
Parr Instrument Co.
Riehle Div.
Sargent & Co.

TESTERS & TESTING MACHINES, Gage (See Gage Testers)

TESTERS & TESTING MACHINES, Gas
American Meter Co.
Burrell Technical Supply
Central Scientific Co.
Connelly Iron Sponge
Eimer & Amend
Fish-Schurman Co.
Fisher Scientific Co.
Friez & Sons
Fuess, Inc.
Gow-Mac Instrument
Refinery Supply Co.
Ruska & Co., Inc.
Sargent & Co.

TESTERS & TESTING MACHINES, Gear
Morse Twist Drill
Scherr Co., Inc.

TESTERS & TESTING MACHINES, Glue
Central Scientific Co.
Eimer & Amend
Fish-Schurman Co.
Olsen Testing Machine
Saxl Inst. Co.

TESTERS & TESTING MACHINES, Grain
Central Scientific Co.
Exact Weight Scale
Gump Co.
Moist-O-Meter, Inc.
Moisture Register Co.
Newark Scale Works
Tagliabue Mfg. Co.
Toledo Scale Co.
Troemner, Henry

TESTERS & TESTING MACHINES, Grease (See Grease Testing Apparatus)

TESTERS & TESTING MACHINES, Grinding Wheel
Olsen Testing Machine

TESTERS & TESTING MACHINES, Ground Resistance
Biddle Co., Jas. G.
Geophysical Inst. Co.
Industrial Insts. Inc.
Sticht & Co.

TESTERS & TESTING MACHINES, Gummed Tape
Amthor Testing Inst.
Scott Co., Henry L.
Thwing-Albert Inst. Co.

TESTERS & TESTING MACHINES, Hardness
Detroit Testing Mach.
Dietert Co.
Ferner Co.
Fisher Scientific Co.
Leitz, Inc.
Olsen Testing Machine
Pittsburgh Inst. & Mach.
Riehle Div.
Saxl Inst. Co.
Shore Instrument
Steel City Testing Lab.
Suter, Alfred
Teleweld, Inc.
Testing Machines, Inc.
Wilson Mech Inst. Co.
Zeiss, Inc., Carl

TESTERS & TESTING MACHINES, Hardness of Grindable Materials
Brabender Corp.

TESTERS & TESTING MACHINES, Hardness of Plastic Films
Munsell Color Co.
Saxl Inst. Co.
Steel City Testing Lab.
Taber Instrument Co.
Testing Machines, Inc.

TESTERS & TESTING MACHINES, Hydrogen-Ion (See Hydrogen Ion Determination Instruments)

TESTERS & TESTING MACHINES, Impact
Baldwin-Southwark Corp.
Cambridge Inst. Co.
Impact Register Co.
Olsen Testing Machine
Riehle Div.
Saxl Inst. Co.
Scott Co., Henry L.
Steel City Testing Lab.
Testing Machines, Inc.
Thwing-Albert Inst.
Saxl Inst. Co.
Zuhr, Inc., Henry

TESTERS & TESTING MACHINES, Initial Tearing
Scott Co., Henry L.
Suter, Alfred
Testing Machines, Inc.
Thwing-Albert Inst. Co.

TESTERS & TESTING MACHINES, Insulation
Associated Research
Biddle Co., Jas. G.
Clough-Brengle Co.
General Elec. Co.
General Radio Co.
Ideal Commutator Dresser
Industrial Insts. Inc.
Leeds & Northrup Co.
Martindale Electric Co.
Miller Co., Bertrand F.
Rawson Electrical Inst.
Rubicon Co.
Scott Co., Henry L.
Shallcross Mfg. Co.
Sticht & Co.
United Transformer Corp.

TESTERS & TESTING MACHINES, Insulation (Thickness)
Comtor Co.
General Elec. Co.
Instrument Specialties Co.

TESTERS & TESTING MACHINES, Jelly
Brabender Corp.
Chatillon & Sons
Fish-Schurman Co.
Saxl Inst. Co.

TESTERS & TESTING MACHINES, Knit Goods (See Textile below)

TESTERS & TESTING MACHINES, Leather
Amthor Testing Inst. Co.
Central Scientific Co.
Olsen Testing Machine
Perkins & Son
Riehle Div.
Saxl Inst. Co.
Scott Co., Henry L.

TESTERS & TESTING MACHINES, Magnetic
Annis Co.
Associated Research
Baird Associates
Commercial Engg. Labs.
General Elec. Co.
Magnetic Analysis Corp.
Pioneer Instrument
Rawson Elec. Instr. Co.
Rubicon Co.

TESTERS & TESTING MACHINES, Malt
Brabender Corp.
Rieker Instrument Co.

TESTERS & TESTING MACHINES, Mileage (See Meters, Mileage)

TESTERS & TESTING MACHINES, Milk
Central Scientific Co.
Eimer & Amend
Munsell Color Co. Inc.
Rieker Inst. Co.
Ruehfel Co.
Ruth Glass Division
Scientific Glass App.
Testrite Instrument Co.
Tagliabue Mfg. Co.

TESTERS & TESTING MACHINES, Moisture
Alpha-Lux Co.
American Inst. Co.
American Moistening Co.
Brabender Corp.
Brown Inst. Co.
Cambridge Inst. Co.
Central Scientific Co.
Delmhorst, Wm. J.
Dietert Co.
Eimer & Amend
Exact Weight Scale
Fisher Scientific Co.
Fuess, Inc.
Humboldt Mfg. Co.
Industrial Inst. Inc.
Moist-O-Meter, Inc.
Moisture Register Co.
Precision Scientific Co.
Rascher & Betzold
Refinery Supply Co.
Saxl Inst. Co.
Scientific Glass App.
Sci Inst. Co. (of Detroit)
Shallcross Mfg. Co.
Sodeman Heat & Power
Tagliabue Mfg. Co.
Testing Machines, Inc.
Thwing-Albert Inst. Co.
Toledo Scale Co.
Troemner, Henry
Williams Apparatus Co.

TESTERS & TESTING MACHINES, Oil
American Inst. Co.
American M. A. N. Corp.
Brabender Corp.
Central Scientific Co.
Eimer & Amend
Fish-Schurman Co.
Hellige, Inc.
Humboldt Mfg. Co.
Mico Instrument Co.
Precision Scientific Co.
Rieker Inst. Co.
Ruehfel Co.
Ruska & Co.
Ruth Glass Division
Scientific Glass App.
Scientific Inst. Co.
Tagliabue Mfg. Co.
Western Machinery Co.

TESTERS & TESTING MACHINES, Oxygen
Burrell Technical Supply
Eimer & Amend
Sargent & Co.
Scientific Glass App.
Scientific Inst. Co.
Tagliabue Mfg. Co.

TESTERS & TESTING MACHINES, Paint
Akatos, Inc.
Atlas Elec. Devices Co.
Central Scientific Co.
Fish-Schurman Co.
Munsell Color Co.
Ruehfel Co.
Saxl Instr. Co.
Scott Co., Henry L.
Taber Instrument Co.
Van Keuren Co.
Zuhr, Inc., Henry

TESTERS & TESTING MACHINES, Paper
American Inst. Co.
Amthor Testing Inst. Co.
Atlas Elec. Devices
Brown Inst. Co.
Central Scientific Co.
Eimer & Amend
Federal Prod. Corp.
Ferner Co.
Fuess, Inc.
Gurley, W. & L. E.
Instrument Specialties Co.
Olsen Testing Machine
Perkins & Son
Riehle Div.
Saxl Inst. Co.
Scott Co., Henry L.
Speidel & Co.
Steel City Testing
Taber Instrument Co.
Toledo Scale Co.
Van Keuren Co.
Williams Apparatus Co.

TESTERS & TESTING MACHINES, Paper Formation
Fuess, Inc.
Green, Arthur B.
Saxl Inst. Co.
Thwing-Albert Inst. Co.
Williams Apparatus Co.

TESTERS & TESTING MACHINES, Paraffin
American Inst. Co.
Perkins & Son
Ruehfel Co.
Tagliabue Mfg. Co.

TESTERS & TESTING MACHINES, Penetration (Paper)
Saxl Inst. Co.
Testing Machines, Inc.
Thwing-Albert Inst. Co.
Williams Apparatus Co.

TESTERS & TESTING MACHINES, Petroleum (See Oil above)

TESTERS & TESTING MACHINES, Pipe & Tube
Baldwin-Southwark Corp.
Black & Decker
Olsen Testing Machine

TESTERS & TESTING MACHINES, Pistol Barrel Optical
Fuess, Inc.
Kollmorgen Optical Co.
Lenox Inst. Co.
Scherr Co., Inc.

TESTERS & TESTING MACHINES, Piston Ring

TESTERS & TESTING MACHINES, Pitch
American Inst. Co.
Precision Scientific Co.

TESTERS & TESTING MACHINES, Plasticity
American Inst. Co.
Brabender Corp.
Dietert Co.
Eimer & Amend
Olsen Testing Machine
Precision Scientific Co.
Saxl Inst. Co.
Scott Co., Henry L.
Steel City Testing
Testing Machines, Inc.

TESTERS & TESTING MACHINES, Porosity
Fuess, Inc.
Gurley, W. & L. E.
Ruska & Co., Inc.
Saxl Inst. Co.
Testing Machines, Inc.
Williams Apparatus Co.

TESTERS & TESTING MACHINES, Pulp
Brabender Corp.
Perkins & Son
Testing Machines, Inc.
Williams Apparatus Co.

TESTERS & TESTING MACHINES, Radio Set
Ferris Instrument Corp.
Hewlett-Packard
Hickok Electrical Inst.
Industrial Instruments
Measurements Corp.
Million Radio & Television
Monarch Manufacturing
Shallcross Mfg. Co.
Supreme Instrument Corp.
Triplett Electrical Inst.
Weston Electrical Inst.

TESTERS & TESTING MACHINES, Rails
Sperry Products, Inc.

TESTERS & TESTING MACHINES, Resistance
Associated Research, Inc.
Biddle Co., James G.
Gray Instrument Co.
Industrial Instruments
Leeds & Northrup Co.
Million Radio & Tele.
Roller-Smith Co.
Shallcross Mfg. Co.
Supreme Instrument Corp.
Triplett Electrical Inst.
Weston Electrical Inst.

TESTERS & TESTING MACHINES Road Material (See Cement above)

TESTERS & TESTING MACHINES, Rubber
American Inst. Co.
Amthor Testing Inst.
Atlas Elec. Devices
Brabender Corp.
Central Scientific Co.
Eimer & Amend
Emerson Apparatus Co.
Federal Prod. Corp.
Ferner Co.
Fish-Schurman Co.
Link Eng. & Mfg.
Olsen Testing Machine
Morehouse Machine Co.
Riehle Div.
Saxl Inst. Co.
Scott Co., Henry L.
Shore Instrument
Suter, Alfred
Steel City Testing
Van Keuren Co.

TESTERS & TESTING MACHINES, Sand
Chatillon & Sons
Dietert Co.
Eimer & Amend
Exact Weight Scale Co.
Humboldt Mfg. Co.
Kolesch & Company
Ruska & Co.

TESTERS & TESTING MACHINES, Scratch Hardness
Dietert Co.
Saxl Inst. Co.
Spencer Lens Co.
Steel City Testing
Taber Instrument Co.
Testing Machines, Inc.

TESTERS & TESTING MACHINES, Shearing
Baldwin-Southwark Corp.
Olsen Testing Machine
Riehle Div.
Saxl Inst. Co.
Suter, Alfred

TESTERS & TESTING MACHINES, Sheet Metal
Baldwin-Southwark Corp.
Bock Machine Co.
Detroit Testing Mach.
Emery Co.
Krouse Fatigue Machine
Olsen Testing Machine
Riehle Div.
Scott Co., Henry L.
Steel City Testing
Suter, Alfred
Taber Instrument Co.

TESTERS & TESTING MACHINES, Slowness
Saxl Inst. Co.
Testing Machines, Inc.
Williams Apparatus Co.

TESTERS & TESTING MACHINES, Softness
Ferner Co.
Gurley, W. & L. E.
Humboldt Mfg. Co.
Saxl Inst. Co.
Taber Instrument Co.
Thwing-Albert Inst. Co.

TESTERS & TESTING MACHINES, Springs
Baldwin-Southwark Corp.
Chatillon & Sons
Detroit Testing Mach.
Emery Co.
Exact Weight Scale
Instrument Specialties Co.
Link Engineering & Mfg.
Olsen Testing Machine
Riehle Div.
Saxl Inst. Co.
Scott Co., Henry L.
Steel City Testing Lab.
Suter, Alfred
Testing Machines, Inc.
Toledo Scale Co.

TESTERS & TESTING MACHINES, Stiffness (Paper)
American Inst. Co.
Ferner Co.
Fuess, Inc.
Olsen Testing Machine
Saxl Inst. Co.
Taber Instrument Co.
Thwing-Albert Inst. Co.
Toledo Scale Co.

TESTERS & TESTING MACHINES, Stiffness & Bending
Ferner Co.
General Elec. Co.
Olsen Testing Machine
Riehle Div.
Saxl Inst. Co.
Suter, Alfred
Taber Instrument Co.
Thwing-Albert Inst. Co.
Toledo Scale Co.

TESTERS & TESTING MACHINES, Strain (Glass)
Akatos, Inc.
American Askania Corp.
Baird Associates
Bausch & Lomb Opt.
Eimer & Amend
Fecker, J. W.
Fuess, Inc.
Gaertner Scientific Corp.
General Elec. Co.
Kollmorgen Optical Co.
Pfaltz & Bauer, Inc.
Polarizing Instrument Co.
Zeiss, Inc., Carl

TESTERS & TESTING MACHINES, Stretch
Perkins & Son
Saxl Inst. Co.
Scott Co., Henry L.
Thwing-Albert Inst. Co.
Suter, Alfred

TESTERS & TESTING MACHINES, Tachometer
Amthor Testing Inst.
Biddle Co., Jas. G.
Consol. Ashcroft Hancock
Elec. Tachometer Corp.
General Elec. Co.
Hayward, H. N.
Pioneer Instrument
Standard Elec. Time
Sticht & Co.
Zeiss, Inc., Carl
Zernickow Co., O.

TESTERS & TESTING MACHINES, Tearing-Paper
Saxl Inst. Co.
Scott Co., Henry L.
Speidel & Co.
Thwing-Albert Inst. Co.

TESTERS & TESTING MACHINES, Tenderness
American Inst. Co.
Humboldt Mfg. Co.
Precision Scientific Co.
Saxl Inst. Co.

TESTERS & TESTING MACHINES, Textile
American Inst. Co.
Atlas Elec. Devices Co.
Brown Inst. Co.
Perkins & Son
Saxl Inst. Co.
Scott Co., Henry L.
Suter, Alfred
Taber Instrument Co.
Thwing-Albert Inst. Co.

TESTERS & TESTING MACHINES, Thermometer
Amthor Testing Inst.
Brown Inst. Co.
Consol. Ashcroft Hancock
Fuess, Inc.
G. M. Mfg. Co.
Green, Henry J.
Huddleston, J. S.
Moeller Instrument Co.
Ruehfel Co.
Schultheis Corp.
Tagliabue Mfg. Co.
Thwing-Albert Inst. Co.
Weksler Thermometer

TESTERS & TESTING MACHINES, Thread
Boulin Instrument Corp.
Holz, Herman A.
Saxl Inst. Co.
Scott Co., Henry L.
Suter, Alfred
Thwing-Albert Inst. Co.

TESTERS & TESTING MACHINES, Torsion
Baldwin-Southwark Corp.
Boulin Instrument Corp.
Detroit Testing Mach.
Emery Co.
Exact Weight Scale
Hathaway Inst. Co.
Hayes Scientific App.
Olsen Testing Machine
Riehle Div.
Saxl Inst. Co.
Steel City Testing
Suter, Alfred
Testing Machines, Inc.
Toledo Scale Co.

TESTERS & TESTING MACHINES, Torsional Creep
Baldwin-Southwark Corp.
Suter, Alfred

TESTERS & TESTING MACHINES, Turn Indicator
Amthor Testing Inst. Co.
Pioneer Instrument
Rieker Instrument Co.
Ruehfel Co.

TESTERS & TESTING MACHINES, Universal (See Testing Machines below)

TESTERS & TESTING MACHINES, Vapor Transmission
Thwing-Albert Inst. Co.

TESTERS & TESTING MACHINES, Varnish
Atlas Elec. Devices Co.
Eimer & Amend
Fish-Schurman Co.
Hellige, Inc.
Taber Instrument Co.
Thermo-Electric Co.
Zuhr, Inc., Henry

TESTERS & TESTING MACHINES, Vibration
Brush Development Co.

TESTERS & TESTING MACHINES, Voltage
Associated Research
Clough-Brengle Co.
General Elec. Co.
Norton Electrical Inst.
Potter Co.
Shallcross Mfg. Co.
Weston Elec. Inst. Corp.

TESTERS & TESTING MACHINES, Water Meter
Badger Meter Co.
Exact Weight Scale
Ford Meter Box Co.
Neptune Meter Co.
Toledo Scale Co.

TESTERS & TESTING MACHINES, Water Penetration
Thwing-Albert Inst. Co.

TESTERS & TESTING MACHINES, Watch Rate
Paulson & Co.

TESTERS & TESTING MACHINES, Watthour Meter
Elec. Facilities Inc.
General Elec. Co.
Hathaway Inst. Co.
Sangamo Electric Co.
Standard Elec. Time
States Co.
Western Electro-Mech.
Westinghouse Elec. & Mfg.

TESTERS & TESTING MACHINES, Weathering
Atlas Elec. Devices Co.
Gen. Elec. Lamp. Dept.

TESTERS & TESTING MACHINES, Wire
Amthor Testing Inst. Co.
Baldwin-Southwark Corp.
Krouse Fatigue Mach.
Olsen Testing Machine
Riehle Div.
Saxl Inst. Co.
Scott Co., Henry L.
Steel City Testing
Suter, Alfred
Taber Instrument Co.

TESTERS & TESTING MACHINES, Yarn
Atlas Elec. Devices Co.
Brown Inst. Co.
Emerson Apparatus Co.
Saxl Inst. Co.
Scott Co., Henry L.
Suter, Alfred
Testing Machines, Inc.

For addresses, see pages 66-76

Solu-Bridge with dip cell. Main control is adjusted until "magic eye" opens. Solution strength is read directly off the calibrated scale in percentage or other desired terms. Can be operated by anyone. Inexpensive. Foolproof.

SOLU-BRIDGE
Solution Testing

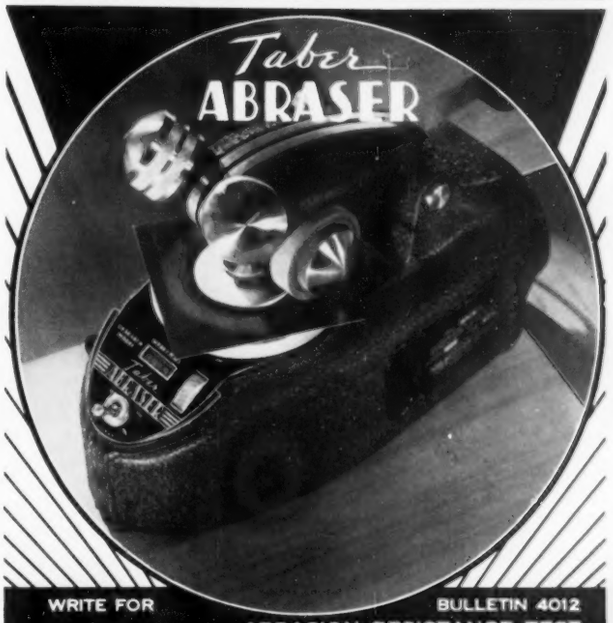
- The SOLU-BRIDGE is an electronic instrument for accurately and instantaneously indicating the concentration of solutions in various industrial fields. Used in checking strength of bottle-washing solutions, checking steam condensate for carry-over, checking distilled water, checking thoroughness of rinsing and washing operations, etc.

The SOLU-BRIDGE CONTROLLER not only checks but also gives visual or audible alarm, or operates valve or other mechanism.

DATA: Technical bulletins on request. Submit your solution checking or testing problem and our engineers will gladly collaborate in applying standard or special equipment.

Industrial Instruments Inc.
156 Culver Ave., Jersey City, N. J.

ABRASER ABRASER ABRASER ABRASER



WRITE FOR BULLETIN 4012

Taber ABRASER

ABRASION RESISTANCE TEST
PLASTICS · ORGANIC COATINGS
ELECTROPLATE · TEXTILES
SHEAR HARDNESS TEST
PLASTICS · ORGANIC COATINGS

TABER INSTRUMENT COMPANY
NORTH TONAWANDA, NEW YORK
EASTERN REPRESENTATIVE
ALFRED SUTER - TEXTILE ENGINEER - 200 FIFTH AVE. N.Y.C.

FERNER Metallurgical and Physical Testing Apparatus

Jarrett System Metallographical Specimen Polishing Machine

Laps, solutions and technique have been definitely established for this machine, to produce quantities of specimens, of uniform flatness, remarkably free from metal flow, scratches or pits . . . in a fraction of the time formerly required: *six specimens in less than an hour!*

Jarrett Specimen Mounting Press

Assures specimen perfection by means of automatic control. No "waiting time": normal time for completion is ten minutes. Even-height mounts regardless of specimen size.

Automatized Specimen Cutters

Submerged method. 2 h-p. a-c. motor. Rubber bonded abrasive wheel.

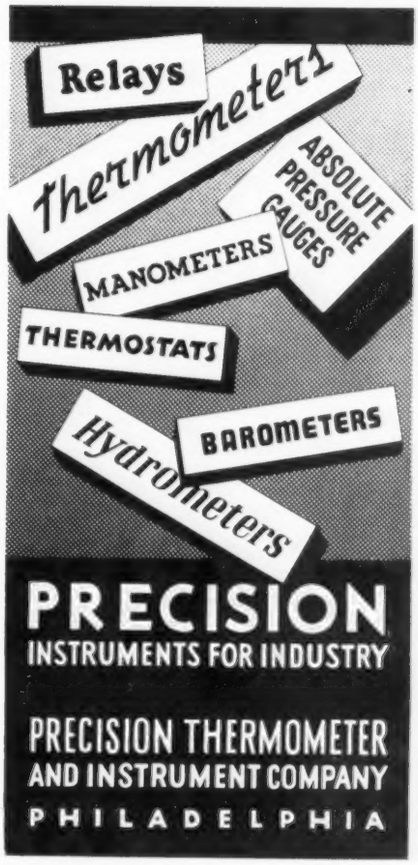
MICROMACHINE

for all types of physical testing of metals . . . Shear . . . Tensile . . . Flexing . . . Hardness.

Other modern instruments and machines for metallurgical, physical and general testing laboratories.

THE R. Y. FERNER CO.
131 STATE STREET, BOSTON, MASS.

INDUSTRIAL THERMOMETERS
LABORATORY THERMOMETERS
THERMOSTATS
THERMOREGULATORS
TEMPERATURE CONTROLS
SPECIAL RELAYS
BAROMETERS
ALTITUDE STANDARDS
ABSOLUTE PRESSURE GAUGES
VACUUM GAUGES
AMMONIA GAUGES
DRAFT GAUGES
RAIN AND SNOW GAUGES
BALLISTIC INSTRUMENTS
GRAVITOMETERS
ORCHARD ALARMS
ORSATS
MANOMETERS
WATER GAUGES
TANK GAUGES
HYGROMETERS
PSYCHROMETERS
HYDROMETERS
CALENDER MICROMETERS



PRECISION
INSTRUMENTS FOR INDUSTRY

PRECISION THERMOMETER AND INSTRUMENT COMPANY
PHILADELPHIA

EXPERIMENTAL AND DEVELOPMENTAL INSTRUMENT MAKING

ELECTRICAL TESTING SETS

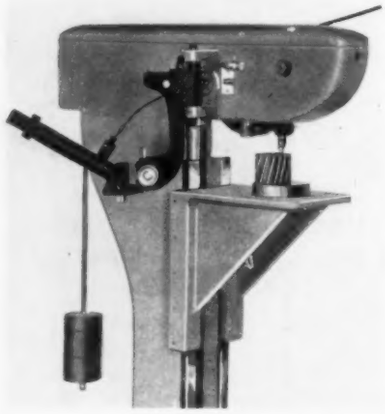
Model 639 Industrial Analyzer—has all interconnections made. Measures current, voltage and power in single or polyphase circuits, and power factor in 3 phase circuits.

Model 785 Circuit Tester—has 27 ranges for voltage, current and resistance measurements wherever high sensitivity is a factor, including signal, control, and electronic circuits.

Other tests sets available for specialized needs. Send for bulletin. Weston Electrical Instrument Corporation, 591 Frelinghuysen Avenue, Newark, N. J.

WESTON *Instruments*

HARDNESS TESTER
(Vickers Type)



DIAMO-BRINELL
TESTING MACHINES FOR
HARD AND SOFT METALS

Ask for catalog on
HAND AND POWER-OPERATED
BRINELL TESTERS

PITTSBURGH
Instrument & Machine Co.
1026 Reedsdale St. Pittsburgh, Pa.

TESTING INSTRUMENTS, OPTICAL
Akatos, Inc.
American Askania Corp.
Am. Telescope Labs.
Bausch & Lomb Optical
Fuess, Inc.
Gaertner Scientific Corp.
Jones & Lamson Machine
Kollmorgen Optical Co.
Leitz, Inc.
Spencer Lens Co.
Wuermann-Scauchhardt

TESTING MACHINES, UNIVERSAL, Dead weight beam, Capacities 0-100 lb.
Dietert Co.
Olsen Testing Machine
Saxl Inst. Co.

TESTING MACHINES, UNIVERSAL, Dead Weight Beam, Capacities 100-5000 lb.
Olsen Testing Machine
Riehle Div.

TESTING MACHINES, UNIVERSAL, Dead weight beam, Capacities 5000-100,000 lb.
Riehle Div.

(TESTING Mach. Cont'd on page 48)

TESTING MACHINES, UNIVERSAL, Dead weight beam, Capacities over 100,000 lb.
Baldwin-Southwark Corp.
Olsen Testing Machine
Riehle Div.

TESTING MACHINES, Universal, Hydraulic, Capacities 0-100 lb.
Dietert Co., Harry W.
Saxl Instrument Co., Inc.
Steel City Testing Lab.
Thwing-Albert Instrument

TESTING MACHINES, Universal, Hydraulic, Capacities 100-5000 lb.
Ashton Valve Co.
Baldwin-Southwark Corp.
Detroit Testing Machine
Dietert Co., Harry W.
Emery Co.
Ferner Co.
Pittsburgh Instrument
Riehle Div.
Saxl Instrument Co.
Steel City Testing Lab.

TESTING MACHINES, Universal, Hydraulic, Capacities 5000-100,000 lb.
Baldwin-Southwark Corp.
Detroit Testing Machine
Riehle Div.
Steel City Testing Lab.

TESTING MACHINES, Universal, Hydraulic, Capacities over 100,000 lb.
Baldwin-Southwark Corp.
Riehle Div.

TESTING MACHINES UNIVERSAL Pendulum. Capacities 0-100 lb.
Amthor Testing Inst. Co.
Dietert Co.
Olsen Testing Machine
Riehle Div.
Saxl Inst. Co.
Scott Co., Henry L.
Steel City Testing
Suter, Alfred

TESTING MACHINES, UNIVERSAL, Pendulum, Capacities 100-5000 lb.
Amthor Testing Inst. Co.
Dietert Co.
Olsen Testing Machine
Riehle Div.
Scott Co., Henry L.
Steel City Testing
Suter, Alfred
Testing Machines Inc.

TESTING MACHINES, UNIVERSAL, Pendulum, Capacities 5000-100,000 lb.
American M. A. N. Corp.
Olsen Testing Machine
Riehle Div.
Steel City Testing
Suter, Alfred

TESTING MACHINES, UNIVERSAL, Pendulum, Capacities over 100 000 lb.
American M. A. N. Corp.
Olsen Testing Machine
Riehle Div.
Steel City Testing
Suter, Alfred

TESTING MACHINES, UNIVERSAL, Spring Dynamometers, Capacities 0-100 lb.
Baldwin-Southwark Corp.
Chatillon & Sons
Saxl Inst. Co.
Scott Co., Henry L.
Toledo Scale Co.

TESTING MACHINES, UNIVERSAL, Spring Dynamometers, Capacities 100-5000 lb.
Baldwin-Southwark Corp.
Dillon & Co.
Dietert Co.
Dorr-Patterson Eng.
Scott Co., Henry L.
Toledo Scale Co.

TESTING MACHINES, UNIVERSAL, Spring Dynamometers, Capacities 5000-100,000 lb.
Baldwin-Southwark Corp.
Riehle Div.
Scott Co., Henry L.
Toledo Scale Co.

TESTING MACHINES, UNIVERSAL, Spring Dynamometer, Capacities over 100,000 lb.
Baldwin-Southwark Corp.
Toledo Scale Co.

TESTING SETS (See also object of measurement and control)

TESTING SETS, Alcohol
G. M. Mfg. Co., Inc.
Precision Therm. & Inst.
Rascher & Betzold
Ruehfel Co.
Scientific Glass App.
Tagliabue Mfg. Co.

TESTING SETS, Automotive
Clough-Brengle Co.
Engelhard, Chas.
Gow-Mac Instrument
Hays Corp.
Hy-Ef Electrical Prod.
Niehoff & Co.
Potter Co.

TESTING SETS, Current Transformer
Eastern Specialty Co.
Elec. Facilities Inc.
Rubicon Co.
West. Electro-Mechanical

TESTING SETS, Electrical
American Automatic Elec.
American Transformer
Associated Research
Clough-Brengle Co.
Columbia Elec. Mfg.
Elec. Facilities, Inc.
General Elec. Co.
Industrial Inst. Inc.
Meter Devices Co.
RCA Manufacturing Co.
Rubicon Co.
Shallcross Mfg. Co.
Sticht & Co.
Superior Electric Co.
Tobe Deutschmann Corp.
West. Electro-Mechanical
Weston Elec. Inst. Corp.

TESTING SETS, Electrical Thermometer
Brown Inst. Co.
Shallcross Mfg. Co.
Tagliabue Mfg. Co.
Thwing-Albert Instrument

TESTING SETS, Ground Resistance
Am. Automatic Electric
Associated Research
Biddle Co., Jas. G.
Industrial Inst., Inc.
Rubicon Co.
Sensitive Research Inst.
Sticht & Co.

TESTING SETS, Insulation
American Transformer Co.
Associated Research, Inc.
Biddle Co., James G.
Clough Brengle Co.
Ferranti Electric, Inc.
General Electric Co.
Hickok Electrical Inst.
Ideal Commutator Dresser
Industrial Instruments
J B L Instrument Co.
Leeds & Northrup Co.
Miller Co., B. F.
Rubicon Co.
Sticht & Co., Herman H.
Weston Electrical Inst.

TESTING SETS, Line Current
Associated Research
Columbia Elec. Mfg.
Elec. Facilities, Inc.
General Elec. Co.
Meter Devices Co.
Roller-Smith Co.
West. Electro-Mechanical
Weston Elec. Inst. Corp.

TESTING SETS, Meters, Electrical
Associated Research
Clough-Brengle Co.
Eastern Specialty Co.
Elec. Facilities, Inc.
General Elec. Co.
RCA Manufacturing Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
States Co.
Weston Elec. Inst. Corp.

TESTING SETS, Meters, Fluid
Bailey Meter Co.
Brown Inst. Co.
Tagliabue Mfg. Co.

TESTING SETS, Portable Combustion
Dwyer Mfg. Co.
Engelhard, Chas.
Friez & Sons
Gow-Mac Instrument
Hays Corp.
Potter Co.

TESTING SETS, Potential transformer
Eastern Specialty Co.
Elec. Facilities, Inc.
Leeds & Northrup Co.
Raytheon Mfg. Co.

★ **Moisture Teller** ★

Rapid and accurate moisture test in percentage by drying. Drying temperature controlled by thermostat. Ideal for plant moisture control or laboratory moisture determinations.

Time required to dry the majority of materials is one minute.

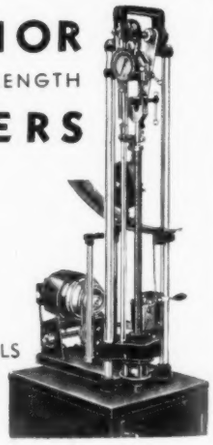
Suitable for granular—fibrous—crystaline materials in industries such as:

Sand—Textile—Tobacco
Ceramic—Rubber—Food
Wood—Mining—Leather

Write for Literature

Harry W. Dietert Co.
9330-C Roselawn Avenue
Detroit, Michigan

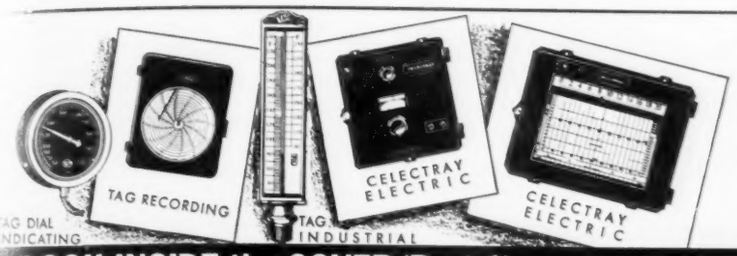
AMTHOR
TENSILE STRENGTH
TESTERS
for
PAPER
CORDAGE
RUBBER
LEATHER
WIRE
FLAT MATERIALS



PAPER FOLDING ENDURANCE TESTER
BURSTING TESTER
MICROMETERS (POCKET and DESK)
PAPER BASIS WEIGHT SCALES
CORDAGE SCALES
ALUMINUM FOIL SCALES
COMPUTING SCALES
RUBBER ABRASION TESTER
DEAD WEIGHT
PRESSURE GAUGE TESTER
TACHOMETERS
INDICATING and RECORDING
MERCURY COLUMN GAUGES

AMTHOR
TESTING INSTRUMENT CO. INC.
48 Van Sinderen Ave., Brooklyn, N. Y.

For addresses, see pages 66-76



TAG THERMOMETERS

A complete line of Indicating and Recording Instruments from the precision mercury-in-glass thermometer to the modern CELECTRAY Pyrometer for laboratory and plant service. By virtue of simple and practical design, rugged construction and precise response to the slightest temperature change within their range, TAG Thermometers are the natural choice for economical supervision of temperatures in your plant.

C. J. TAGLIABUE MFG. CO.
Park & Nostrand Avenues, Brooklyn, N. Y.

LOOK INSIDE the COVER (Part 1) For a COMPLETE LIST of TAG INSTRUMENTS TAG

TESTING SETS, Telephone
Am. Automatic Electric
Shallcross Mfg. Co.

TESTING SETS, Water
Burrell Technical Supply
Industrial Inst., Inc.
Scientific Glass App.

TESTING SIEVE SHAKER
Newark Wire Cloth Co.

TESTING SIEVES
Newark Wire Cloth Co.

THEODOLITES (See Surveying Instruments)

THERMIONIC RECTIFIERS (See Rectifiers, Thermionic)

THERMO - AMMETERS (See Ammeters, Thermo)

THERMOCOUPLES, Base-Metal
Bacharach Industrial Inst.
Bristol Co.
Brown Inst. Co.
Cambridge Inst. Co.
Engelhard, Chas.
Foxboro Co.
General Elec. Co.
Hoskins Mfg. Co.
Ill. Testing Labs.
J-B-T Insts. Inc.
Leeds & Northrup
Lewis Engg. Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Thwing-Albert Instrument
Wheelco Inst. Co.

THERMOCOUPLES, Contact Type
Bailey Meter Co.
Bristol Co.
Cambridge Inst. Co.
(Cont'd)

THERMOCOUPLES, Contact Type (Cont'd)
General Controls Co.
Hickok Elec. Inst. Co.
Ill. Testing Labs.
J-B-T Instruments
Lewis Engg. Co.
Sensitive Research Inst.
Tagliabue Mfg. Co.
Thwing-Albert Instrument
Wheelco Inst. Co.

THERMOCOUPLES, Rare-metal (See Base Metal above)

THERMOCOUPLES, Separate Heater Type
General Radio Co.

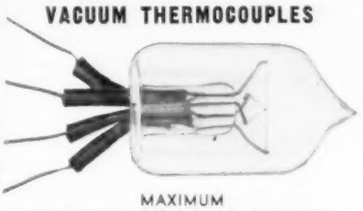
THERMOCOUPLES, Vacuum
Am. Elec. Sales Co.
Cambridge Inst. Co.
Field Electric
General Elec. Co.
General Radio Co.
Hickok Elec. Inst. Co.
Rawson Elec. Inst. Co.
Sensitive Research Inst.
Xervac Inst. Co.

THERMO-HYDROMETERS (See Hydrometers, Thermo)

THERMOMETER TESTERS (See Testers, Thermometer)

THERMOMETERS, Indicating, Electrical Resistance
Am. Temperature Ind.
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
De Jur-Amsco Corp.
Engelhard, Chas.
Foxboro Co.
(Cont'd)

VACUUM THERMOCOUPLES



MAXIMUM
RELIABILITY—EFFICIENCY—STABILITY
New Reduced Prices
Write for Bulletin K-56
FIELD ELECTRICAL INSTRUMENT CO.
2258 Morris Ave. New York, N. Y.

Vacuum - - - Thermocouples
featuring
DEPENDABLE STABILITY
HIGHER OVERLOAD
FASTER RESPONSE
Our thermocouples will meet the most rigid requirements. Write your requirements to—
American Electrical Sales Co., Inc.
67 E. 8th ST. NEW YORK, N. Y.

MARSH

THERMOMETERS
The Marsh line of dial thermometers and industrial instruments is most complete, including self-contained and distant reading dial thermometers, recording thermometers, indicating and recording pressure gauges, engine registers, engine room clocks, etc. Literature will be sent upon request.
JAS. P. MARSH CORPORATION
2047 SOUTHPORT AVE., CHICAGO, ILL.

THERMOMETERS, Indicating, Electrical Resistance (Cont'd)
General Elec. Co.
Gow-Mac Instrument
G-M Labs.
Ill. Testing Labs.
J-B-T Insts. Inc.
Leeds & Northrup Co.
Rubicon Co.
Shallcross Mfg. Co.
Tagliabue Mfg. Co.
Thwing-Albert Instrument
Trerice Co.
Weston Elec. Inst. Corp.
Wheelco Inst. Co.

THERMOMETERS, Indicating, Mechanical
Bristol Co.
Consol. Ashcroft Hancock
Dillon & Co.
(Cont'd)

THERMOMETERS, Indicating, Mechanical (Cont'd)
Foxboro Co.
Fuess, Inc.
G. M. Mfg. Co., Inc.
Gotham Inst.
H-B Inst. Co., Inc.
Kolisman Inst. Co.
Marsh Corp.
Partlow Corp.
Phila. Thermometer Co.
Rochester Mfg. Co.
Scientific Inst. Co.
Standard Thermometer
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Trerice Co.
U. S. Gauge Co.
Wagner & Son
Weksler Thermometer
Western Machinery Co.
Weston Elec. Inst. Corp

THERMOMETERS, Indicating, Mercury-in-Glass, Industrial & Laboratory
Ace Glass, Inc.
Accuracy Scientific Inst.
Bristol Co.
Brooklyn Thermometer Co.
Chaslyn Co.
Consol. Ashcroft Hancock
Fairchney Inst. Corp.
Fish-Schurman Co.
Fleischhauer & Son
Fried & Lustig
Fuess, Inc.
G. M. Mfg. Co., Inc.
Gotham Inst. Co.
Green, Henry J.
Griebel Instrument Co.
H-B Inst. Co., Inc.
Industrial Inst. Co.
Johnson Service Co.
Kessler Co.
Kimble Glass Co.
Moeller Instrument Co.
Nurnberg Thermometer
Palmer Co.
Paulstich & Sons
Phila. Thermometer
Precision Therm. & Inst.
Rascher & Betzold
Rieker Instrument Co.
Ruth Glass Division
Scientific Glass App.
Scientific Inst. Co.
Standard Therm. Corp.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Trerice Co.
Weksler Thermometer
Wilder Sales Co.

THERMOMETERS, Indicating, Pressure-spring
Bailey Meter Co.
Bristol Co.
Dickson Co.
Foxboro Co.
Industrial Instrument Co.
King-Seeley Corp.
Liquidometer Co., Inc.
Marsh Corp., Jas. P.
Mason-Neilan Regulator
Moeller Instrument Co.
Palmer Co.
Partlow Corp.
Powers Regulator Co.
Practical Instrument Co
Preferred Utilities Mfg.
Republic Flow Meters
Rochester Mfg. Co.
Scientific Inst. Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
United States Gauge Co.
Welch Mfg. Co.

THERMOMETERS, Indicating, Spirit-in-Glass
Accuracy Scientific
Brooklyn Thermometer Co.
Fairchney Instrument Corp.
Fink-Roselleve Co.
Fleischhauer & Son, F.
Friez & Sons, Julien
Green, Henry J.
Griebel Instrument Co.
Huddleston, J. S. F.
Industrial Instrument Co.
Kessler Co.
Kimble Glass Co.
King-Seeley Corp.
Minneapolis-Honeywell
Moeller Instrument Co.
Nurnberg Thermometer Co.
Palmer Co.
Philadelphia Thermometer
Precision Therm. & Inst.
Scientific Instrument Co.
Tagliabue Mfg. Co., C. J.
Taylor Instrument Cos.
Trerice Co., H. O.

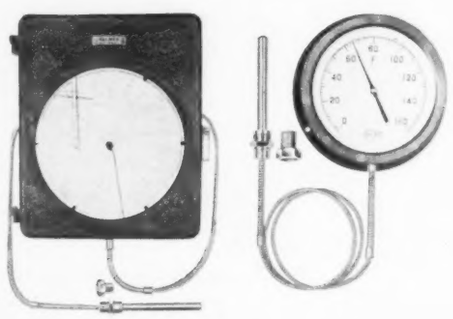
THERMOMETERS, Maximum & Minimum Registering
Accuracy Scientific
Fairchney Instrument Corp.
Fleischhauer & Son, F.
Green, Henry J.
Huddleston, J. S. F.
Moeller Instrument Co.
Nurnberg Thermometer Co.
Palmer Co.
Philadelphia Thermometer
Rieker Instrument Co.
Schultheis Corp., E. W.
Scientific Instrument Co.
Tagliabue Mfg. Co., C. J.
Taylor Instrument Cos.
Trerice Co., H. O.
Wilder Sales Co.

THERMOMETERS, Portable
Bristol Co.
Brown Inst. Co.
Consol. Ashcroft Hancock
Dickson Co.
Engelhard, Chas.
Foxboro Co.
Friez & Sons
Green, Henry J.
Mason-Neilan Regulator
Moeller Inst. Co.
Powers Regulator Co.
Practical Instrument Co.
Scientific Inst. Co.
Tagliabue Mfg. Co.
Taylor Inst Cos.
Wagner & Son
Western Machinery Co.

THERMOMETERS, Recording and/or Controlling, Electrical Resistance
Bailey Meter Co.
(Cont'd)

ESSENTIAL

To National Defense . . . . . *are* FINE TEMPERATURE INSTRUMENTS



As important as proper food for the ARMY are good Temperature Instruments that help to build and maintain the equipment necessary in modern defense work . . . And PALMER Thermometers will stand the tests for accuracy because they have been made with A-1 materials, by highly skilled workmen and are thoroughly annealed for lasting accuracy.

(Write for new editions: No. 200-F and No. 300-D catalogs)

THE PALMER CO.
Mfgr. Indicating-Recording-Dial Thermometers
2517 Norwood Ave., Cincinnati, Norwood, Ohio
Canadian Plant: King and George Sts., Toronto, Canada

For addresses, see pages 66-76

FOXBORO

Reg. U. S. Pat. Off.

THERMOMETERS

All Foxboro Thermometers are extremely accurate and responsive. They have the Mono-Therm System which assures sustained accuracy and long life. Whether you need an Indicating, Recording or Controlling Thermometer, write to Foxboro for complete information. Ask for a copy of Bulletin No. 298-2. **The Foxboro Company, 46 Neponset Avenue, Foxboro, Mass., U. S. A.** Branch offices in 25 principal cities.

Taylor

ETCHED STEM THERMOMETERS

Write for complete information and catalogs.

Taylor Instrument Companies

ROCHESTER, N.Y. TORONTO, CANADA

THERMOMETERS, Recording and/or Controlling, Elec. Resistance (Cont'd)
Bristol Co.
Brown Inst. Co.
Cambridge Inst. Co.
De Jur Amsco Corp.
Engelhard, Chas.
Foxboro Co.
General Elec. Co.
G-M Labs.
Ill. Testing Labs.
Leeds & Northrup Co.
Tagliabue Mfg. Co.
Thwing-Albert Instrument

THERMOMETERS, Recording and/or Controlling, Mechanical
Consol. Ashcroft Hancock
Elematic Mfg. Co.
Fee & Stemwedel
Foxboro Co.
Friez & Sons
Gotham Inst. Co.
Green, Henry J.
H-B Inst. Co., Inc.
Mason-Neilan Regulator
Moeller Instrument Co.
Palmer Co.
Partlow Corp.
Standard Thermometer
Tagliabue Mfg. Co.

THERMOMETERS, Recording and/or Controlling, Pressure-spring
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Consol. Ashcraft Hancock
Defender Automatic Reg.
Dickson Co.
Foxboro Co.
Gotham Inst. Co.
Industrial Inst. Co.
Liquidometer Co.
Marsh Corp.
Mason-Neilan Regulator
Moeller Instrument Co.
Palmer Co.
Partlow Corp.
Powers Regulator Co.
Practical Instrument Co.
Preferred Utilities Mfg.
Republic Flow Meters
Scientific Inst. Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Trerice Co.
Wagner & Son

THERMOPILES
Binckley, G. S.
Cambridge Inst. Co.
Eppley Lab.
Gaertner Scientific Corp.
Hoffman Co., S. O.
(Cont'd)

THERMOPILES (Cont'd)
Leeds & Northrup Co.
Rawson Electric Inst.

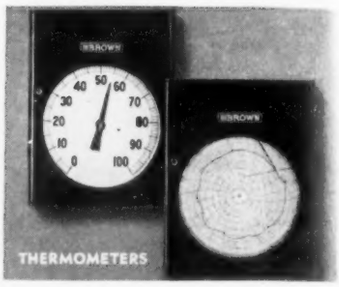
THERMOREGULATORS, Mercury-in-Glass
Eastern Engineering Co.
Fisher Scientific Co.
Friez & Sons
Moeller Instrument Co.
Philadelphia Thermometer
Sargent & Co., E. H.
Scientific Glass App.
Tagliabue Mfg. Co., C. J.
Taylor Instrument Cos.

THERMOSTATS
Accuracy Scientific Inst.
Allen-Bradley Co.
American Inst. Co.
Automatic Products Co.
Brown Inst. Co.
Burling Inst. Co.
Controls, Inc.
Dickson Co.
Eastern Engg. Co.
Edison Elec. Controls
Eimer & Amend
Elematic Mfg. Co.
Fish-Schurman Co.
Fisher Scientific Co.
Friez & Sons
Fulton Syphon Co.
General Controls Co.
General Elec. Co.
Hagan Corp.
Hart Mfg. Co.
H-B Inst. Co., Inc.
H & H Thermostats
Johnson Service Co.
Klipfel Mfg. Co.
McCorkle Co.
Mercoid Corp.
Minneapolis-Honeywell
Partlow Corp.
Penn Electric Switch
Perfex Corp.
Philadelphia Thermometer
Powers Regulator Co.
Precision Scientific Co.
Precision Therm. & Inst.
Ranco, Inc.
Rascher & Betzold
Robertshaw Thermostat
Scientific Glass App.
Spencer Thermostat Co.
Standard Therm., Inc.
Supreme Elec. Prods.
Tagliabue Mfg. Co.
Ulanet Co.
Wilcolator Co.

THERMOSTATIC METALS (See Metals, Thermostatic)

THERMO-VOLTMETERS (See Voltmeters, Thermo)

THICKNESS GAGES (See Gages, Thickness)



For Controlling, Recording and Indicating Temperatures from —40°F to +1200°F.

A pressure type, remote bulb type thermometer, consisting of instrument, bulb and connecting tubing completely assembled as one unit. Can be furnished with connecting tubing lengths up to 200 feet.

Charts and scales for a wide variety of ranges are available, from a minimum temperature span of 75°F to a maximum span of 1200°F. Corresponding Centigrade scales and charts are also available.

Controllers and recorders furnished with a 12" or a 10" diameter chart. Indicators are equipped with a 26" concentric or a 7½" eccentric scale. Three kinds of thermal systems are available: vapor-filled, gas-filled, and mercury-filled.

Bulbs, sockets and connecting tubing can be furnished in various styles and material to meet the requirements of each individual job.

Write for Catalog 6706. THE BROWN INSTRUMENT COMPANY, *a division of Minneapolis-Honeywell Regulator Co.*, 4482 Wayne Avenue, Philadelphia, Pa.

BROWN THERMOMETERS
AND
MINNEAPOLIS-HONEYWELL CONTROL SYSTEMS

To Measure and Control is to Economize

READABLE, RUGGED ALL-METAL THERMOMETERS

Rugged, all-metal construction simplifies installation and keeps breakage at a minimum. Large gauge-type scales facilitate accurate reading. Industrial models available in both straight and angle stem types . . . accuracy within 1% . . . stem lengths up to 24". Accuracy of laboratory type ½ of 1%. Bulletin available. Weston Electrical Instrument Corporation, 591 Frelinghuysen Ave., Newark, N.J.

WESTON *Instruments*

NEW ADJUSTABLE ELECTRIC CONTACT THERMOMETER

(Thermoregulator)

With resettings possible within a few seconds.

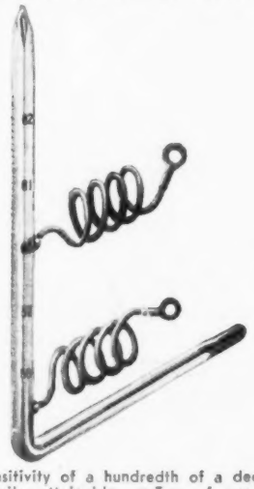
A new departure in electric contact thermometers. Employs a magnet for resetting contact points. Temperature ranges—85° C. to 175° C. or 30° F. to 200° F. Guaranteed accuracy— ±0.1°C. Operates on 110 volts (25, 50 or 60 cycles), 5 to 10 milliamperes.

Leaflet on request.

Brabender Corporation Rochelle Park, New Jersey

For Extremely Close Temperature Control

Visual-Stats



● Sensitivity of a hundredth of a degree is easily attainable. ● Top of mercury column visible at control point (where most important) because electrodes terminate at back of tube. No encircling metal bands! ● Available in angle form (illustrated) or conventional straight form. ● Send for brief, attractive bulletin.

The Philadelphia Thermometer Co.
915 Filbert Street -:- Philadelphia

Oldest Thermometer Manufacturer in Philadelphia

For addresses, see pages 66-76

Two of Many Specialties

Modified and simplified Beckmann type thermometer recommended for inexperienced laboratory workers and preferred by technicians of long experience. Improved and heavier construction of capillary obviates customary glass case . . . does away with rattling of thin tube . . . Less expensive, too!

New quick-reading thermometer for micro testing. Perfected construction of enclosed porcelain scale assures permanent readability. Long thin bulb speeds up response: this is an eight-second thermometer! Available in any range; generally furnished in sets of three: 0-100, 100-200 and 200-300°C. (or equivalent F.). Size approx. 6 inches.

Why not write immediately to this company? Do so, with the assurance that your inquiries will receive prompt and intelligent attention—without obligating you in any way.

Our catalogue A 40 covering a general line of hydrometers and thermometers may be had upon request.

Walter H. Kessler Co.
128 Water Street, New York

Taylor RECORDERS

For
Temperature, Pressure,
Flow and Liquid Level

•

Notable for long-lived, accurate performance. Created by experienced engineers — designed by craftsmen — backed by continuous research.

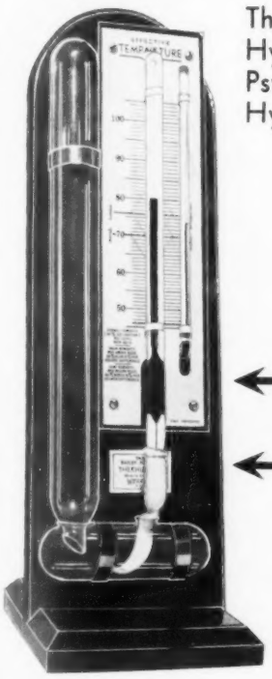
Outstanding Features:

- Quick, easy, one-hand chart-changing.
- Stainless steel pivots, pens, pen arms, etc.
- Die-cast aluminum chart plate — rigid surface for chart notations.
- Universal case, instantly adaptable for face or flush mounting.
- Readily convertible into controller.
- One-, two-, or three-pen records.
- New, improved electric chart drive, or spring-driven type.
- Interchangeable temperature and pressure systems.

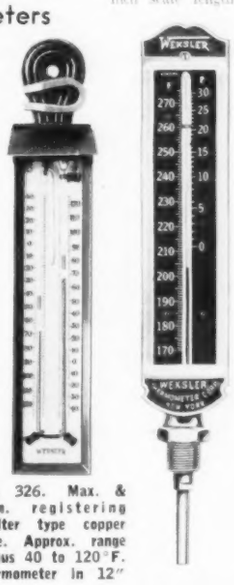
Write for complete information and catalogs to:

Taylor Instrument Companies
ROCHESTER, NEW YORK TORONTO, CANADA

Thermometers
Hygrometers
Psychrometers
Hydrometers



No. 169. For pressure-cooking processes; with 2 scales: 170-270°F. and 0-30 lbs. pressure. Nine-inch scale length.



No. 326. Max. & min. registering shelter type copper case. Approx. range minus 40 to 120°F. thermometer in 12″

NEW Bailey-Parsons Therhumiter reacting to effects of temperature, humidity and air circulation, providing best guide for air conditions in workrooms, offices, etc. The red-spirit thermometer in center responds to Effective Temperature by reason of its dry-bulb DB and wet-bulb WB being in series.

Weksler Thermometers are offered in FOUR different styles of glass: White enamel back; yellow enamel back; Hespe; red-reading mercury.

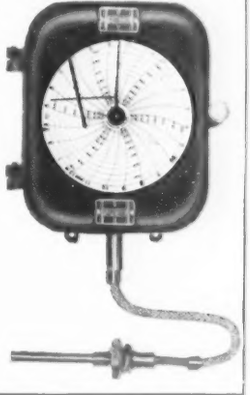
WEKSLER THERMOMETER CORPORATION
535 PEARL STREET, NEW YORK, N. Y.
A Complete Line of Laboratory and Industrial Thermometers

GOTHAM

Temperature Instruments

Recording

Industrial



Dial Indicating

GOTHAM INSTRUMENT CO.
Mfrs. of Indicating & Recording Thermometers
127 Spring St. New York City

THREAD MEASURING WIRES (See Wires, Thread Measuring)
TIDE GAGES
American Inst. Co.
Ballauf Mfg. Co.
Fuess, Inc.
Gurley, W. & L. E.
Uehling Inst. Co.
TIME, Controllers (See Controllers, Automatic, Time)
TIME Indicators
Bristol Co.
Fuess, Inc.
Gaertner Scientific Corp.
Gotham Inst. Co.
Jaeger Watch Co.
Paragon Electric Co.
Rawson Electrical Inst.
Stromberg Electric Co.
Tagliabue Mfg. Co.
Thompson Clock Co.
Warren Telechron Co.
TIME, Recorders
Am. Automatic Electric
Bristol Co.
Cramer & Co., Inc.
Esterline-Angus Co.
Friez & Sons
Fuess, Inc.
Gaertner Scientific Corp.
Gotham Inst. Co.
Industrial Instrument Co.
Jaeger Watch Co.
Paragon Electric Co.
Scientific Inst. Co.
(Cont'd)

TIME, Recorders (Cont'd)
Service Recorder Co.
Simplex Time Recorder
Stromberg Electric Co.
Tagliabue Mfg. Co.
TIME INTERVAL APPARATUS
Am. Gas Accumulator
American Timer Corp.
Betts & Betts
Coleman Elec. Co.
Cramer & Co., Inc.
Edison Electrical Controls
General Electric X-Ray
Guardian Elec. Mfg. Co.
Luxtrol Co., Inc.
Marston Co.
Paragon Electric Co.
Perfex Corp.
Standard Elec. Time Co.
Stromberg Electric Co.
Thompson Clock Co.
United Cellophone Corp.
Walser Automatic Timer
Warren Telechron Co.
Westinghouse Elec. & Mfg.
Zenith Electric Co.
TIME METERS (See meters, time)
TIME OPERATION, Recorders
Am. Automatic Electric
Automatic Time Stamp
Bristol Co.
Brown Inst. Co.
Calculagraph Co.
Cincinnati Time Rec.
(Cont'd)

TIME OPERATION, Recorders (Cont'd)
Consol. Ashcroft Hancock
Cramer & Co., Inc.
Elec. Tachometer Corp.
Esterline-Angus Co.
Gaertner Scientific Corp.
General Elec. Co.
Gotham Inst. Co.
Industrial Instrument Co.
Jaeger Watch Co.
Intern'l Business Mach.
Marston Co.
Paragon Electric Co.
Practical Instrument Co.
Production Inst. Co.
Service Recorder Co.
Tagliabue Mfg. Co.
TIME STAMPS
Automatic Time Stamp
Cincinnati Time Rec.
Intern'l Business Mach.
Simplex Time Recorder
Stromberg Electric Co.
TIME STUDY APPARATUS
Automatic Temperature
Automatic Stamp Co.
Clare & Co., C. P.
Dietzgen Co., Eugene
Electric Tachometer Corp.
Hasler-Tel Co.
Industrial Instrument Co.
National Instrument Co.
Standard Electric Time Co.
TIME SWITCHES (See Switches, Time)
TIMERS, AUTOMATIC, Automatic Reset
Am. Gas Accumulator
Automatic Elec. Mfg.
Automatic Temp. Control
Betts & Betts
Bristol Co.
Cramer & Co., Inc.
Eagle Signal Corp.
Edison Electrical Controls
Guardian Elec. Mfg. Co.
Mason-Neilan Regulator
Paragon Electric Co.
Production Inst. Co.
Stromberg Electric Co.
Struthers-Dunn
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Warren Telechron Co.
Zenith Electric Co.
TIMERS, AUTOMATIC, Cycle
Am. Gas Accumulator
Autocall Co.
Automatic Temp. Control
Betts & Betts
Bristol Co.
Brown Inst. Co.
Consol. Ashcroft Hancock Controls, Inc.
Cramer & Co., Inc.
Eagle Signal Corp.
Elec. Switch Corp.
Foxboro Co.
(Cont'd)

TIMERS, AUTOMATIC, Cycle (Cont'd)
Hanlon-Waters, Inc.
Industrial Inst. Co.
Luxtrol Co., Inc.
Minneapolis-Honeywell
Paragon Electric Co.
Penn Electric Switch
Sangamo Electric Co.
Stromberg Electric Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Thomas Clock Co.
Thompson Clock Co.
Walser Automatic Timer
Warren Telechron Co.
West. Electro-Mechanical
Weston Elec. Inst. Corp.
Wheelco Inst. Co.
Zenith Electric Co.
TIMERS, AUTOMATIC, Interval
Am. Gas Accumulator
Am. Timer Corp.
Anderson, A. & J. M.
Automatic Elec. Mfg.
Automatic Temp. Control
Bacon, Emra D.
Betts & Betts
Bristol Co.
Controls, Inc.
Cramer & Co., Inc.
Eagle Signal Corp.
Edison Electrical Controls
Elec. Switch Corp.
Fink-Roselieve Co.
Frober-Faybor Co.
General Electric X-Ray
Glogau & Co.
Guardian Elec. Mfg.
Industrial Engr. Corp.
Industrial Timer Corp.
Luers, J. Milton
Minneapolis-Honeywell
Paragon Electric Co.
Perfex Corp.
Production Inst. Co.
Standard Elec. Time
Stromberg Electric Co.
Struthers-Dunn
Tagliabue Mfg. Co.
Thomas Clock Co.
Thompson Clock Co.
Walser Automatic Timer
Warren Telechron Co.
Zenith Electric Co.
TIMERS, AUTOMATIC, Process
Am. Gas Accumulator
Autocall Co.
Automatic Elec. Mfg.
Automatic Temp. Control
Betts & Betts
Bristol Co.
Consol. Ashcroft Hancock Controls, Inc.
Cramer & Co., Inc.
Denver Fire Clay
Eagle Signal Corp.
Electric Controller
Elec. Switch Corp.
Foxboro Co.
Gaertner Scientific Corp.
Industrial Engr. Corp.
Industrial Inst. Co.
Industrial Timer Corp.
Luxtrol Co., Inc.
Magnetic Gauge Co.
Paragon Electric Co.
Powers Regulator Co.
Stromberg Electric Co.
Struthers-Dunn
Tagliabue Mfg. Co.
Taylor Inst. Cos.
United Cinephone Corp.
Warren Telechron Co.
West. Electro-Mechanical
Weston Elec. Inst. Corp.
Woermann-Schuchhardt
Zenith Electric Co.
TIMERS, AUTOMATIC, Spot Weld
Allen-Bradley Co.
Am. Gas Accumulator
Cramer & Co., Inc.
Cutler-Hammer, Inc.
Electric Controller
General Elec. Co.
United Cinephone Corp.
TITRATION APPARATUS, Electrometric
Burrell Technical Supply
Cambridge Instrument Co.
Central Scientific Co.
Coleman Electric Co.
Fisher Scientific Co.
Leeds & Northrup Co.
National Technical Labs.
Rubicon Co.
Sargent & Co., E. H.
Thomas Co., Arthur H.
Welch Scientific Co.
TOOLMAKER'S FLATS
Bausch & Lomb Opt.
Fecker, J. W.
Pratt & Whitney
Van Keuren Co.
Zeiss Inc., Carl
TOPOGRAPHIC INSTRUMENTS (See Surveying Instruments)
TORQUE GAGES (See Gages, Torque)
TORSIOGRAPH
Baldwin-Southwark Corp.
Commercial Engr. Labs.
TORSION METERS
Boulin Inst. Corp.
Cummings Mach. Works
Holz, Herman A.
Kurman Electric Co.
McNab of Bridgeport
Riehle Div.
(Cont'd)

TORSION METERS (Cont'd)
Saxl Inst. Co.
Toledo Scale Co.
TOTALIZERS, Demand
American Meter Co.
General Elec. Co.
Therm-Electric Meters Co.
United Cinephone Corp.
Westinghouse Elec. & Mfg.
TOTALIZERS, Electric Energy
Autocall Co.
Esterline-Angus Co.
General Elec. Co.
Therm-Electric Meters Co.
Westinghouse Elec. & Mfg.
TOTALIZERS, Fluid Flow
American Meter Co.
Bailey Meter Co.
Brown Inst. Co.
Foxboro Co.
Builders Iron Foundry
Henszey Co.
Mason-Neilan Regulator
Republic Flow Meters
Tagliabue Mfg. Co.
Taylor Inst. Cos.
TOTALIZERS, Gas Flow
American Meter Co.
TOTALIZERS, Running Time
Cramer & Co., Inc.
Elec. Tachometer Corp.
Photoswitch, Inc.
Production Instrument
United Cinephone Corp.
Westinghouse Elec. & Mfg.
TRAFFIC SIGNALING DEVICES (See Signaling Devices, Traffic)
TRAMMELS, Steel Beam
Union Tool Co.
TRANSFORMERS, Adjustable
General Radio Co.
Superior Electric Co.
TRANSFORMERS, Constant Voltage
Sola Electric Co.
TRANSFORMERS, Experimenter's Variable Voltage
Dongan Electric Mfg.
TRANSFORMERS, Instrument
Allis-Chalmers Mfg.
Annis Co.
Columbia Elec. Mfg.
Davis & Co.
Dongan Electric Mfg.
Elec. Facilities, Inc.
Esterline-Angus Co.
Friez & Sons
General Elec. Co.
Hickok Elec. Inst. Co.
Industrial Engr. Corp.
Lipman Engg. Co.
Miller Co., Bertrand F.
Roller-Smith Co.
Sangamo Electric Co.
Thordarson Elec. Co.
United Transformer Corp.
West. Electro-Mechanical
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.
TRANSFORMERS, Insulation Testing
Campbell Electric
Dongan Electric Mfg.
TRANSFORMERS, Laboratory
American Transformer
Central Scientific Co.
Clough-Brengle Co.
Daven Co.
Davis & Co.
Dongan Electric Mfg.
Eastern Specialty Co.
Elec. Facilities, Inc.
General Elec. Co.
General Radio Co.
Halldorson Co.
Standard Elec. Prods.
Miller Co., Bertrand F.
Raytheon Mfg. Co.
Sola Electric Co.
Superior Electric Co.
Thordarson Elec. Co.
United Transformer Corp.
(Cont'd)

TRANSFORMERS, Laboratory (Cont'd)
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.
TRANSFORMERS, Phasing
Davis & Co.
Dongan Electric Mfg.
Eastern Specialty Co.
Stanco Co.
Thordarson Mfg. Co.
United Transformer Corp.
Westinghouse Elec. & Mfg.
TRANSFORMERS, Power
Ferranti Electric
TRANSFORMERS, Split Core
Davis & Co.
Elec. Facilities, Inc.
General Elec. Co.
H-D Elec. Co.
Industrial Eng. Corp.
Roller-Smith Co.
Rubicon Co.
Sangamo Electric Co.
Thordarson Elec. Co.
United Transformer Corp.
Western Electro-Mech.
Westinghouse Elec. & Mfg.
TRANSFORMERS, Variable Voltage Testing
American Transformer
Dongan Electric Mfg.
Superior Electric Co.
TRANSITS, Astronomical
American Askania Corp.
TRANSITS, Engineer's (See Surveying Instruments)
TRANSITS, Pocket
Ainsworth & Sons
Keuffel & Esser Co.
Mico Instrument Co.
Speidel & Co.
Warren-Knight Co.
White Co., Inc.
TRUCK MILEAGE RECORDERS (See Meters, Mileage)
TRUCK-TIME RECORDERS
Cramer & Co., Inc.
Durant Mfg. Co.
Knopf, Paul
Ohmer Register Co.
Service Recorder Co.
TRUCK, TIME & MILEAGE RECORDERS
Cramer & Co., Inc.
Ohmer Register Co.
Sangamo Electric Co.
TUBES (See also Gas & Vapor Discharge Tubes)
TUBES, Cathode Ray (See Cathode Ray Tubes)
TUBES, Nessler (See Nessler Tubes)
TUBES, Oil Centrifuge (See Oil Centrifuge Tubes)
TUBES, Photoelectric
Continental Electric Co.
General Electric Co.
General Scientific Corp.
Photobell Corp.
United Cinephone Corp.
Vacutron, Inc.
TUBES, Pitot (See Flowmeters, Pitot Tube)
TUBES, Polariscope
Akatos, Inc.
American Inst. Co.
Bausch & Lomb Optical
Central Scientific Co.
Eimer & Amend
Fecker, J. W.
Gaertner Scientific Corp.
Hellige, Inc.
Jarrell-Ash Co.
Precision Scientific Co.
Sargent & Co.
Woermann-Schuchhardt
TUBES, Precision Bore (See Precision Bore Glass Tubing)
TUBES, Pyrometer
Bristol Co.
Fish-Schurman Corp.
Hoskins Mfg. Co.
Illinois Testing Labs.
Leeds & Northrup Co.
(Cont'd)

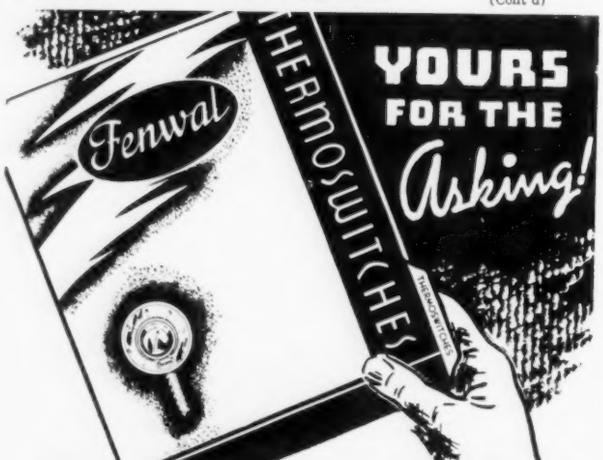
Taylor

Mercury-in-glass Industrial Thermometers

Write for complete information and catalogs.

Taylor Instrument Companies

ROCHESTER, N.Y. TORONTO, CANADA



Get this handy "File Folder" catalog of Fenwal Thermoswitches, these compact rugged thermoresponsive electric switches that are finding new applications in many industries every day.

Various types, developed for particular requirements, are fully described and illustrated. Write today on company letterhead for your copy.

Fenwal INCORPORATED

25 MAIN STREET
ASHLAND, MASSACHUSETTS

TIME DELAY RELAYS

- TIME DELAY SWITCHES OR RELAYS— Thermostatically controlled or motor driven; for any voltage, any load, any application.

Also:

- PROCESS TIMERS
- PROGRAM CONTROLS
- IMPULSE TIMERS
- CODE CONTACTORS
- FLASHERS
- SIGNAL CONTROLS

Ask for details and give details to save time.

BETTS & BETTS CORPORATION
THERMOSTATIC FLASHERS · MOTOR DRIVEN CONTROLS · SPECIAL TIMERS
551 WEST 52nd STREET, NEW YORK, U.S.A.

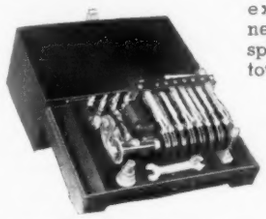
For addresses, see pages 66-76

Automatic TIMING ... by atc

Dependable Control Over Process Periods or Process Actions

Accurate control of processes and operations on the basis of TIME, is a major business with ATC. Installations, numbered in the thousands, are daily paying their way with most reliable—therefore most economical—performance. Standard models will start, stop or repeat operations on one to forty load circuits. Adjustment can be exactly what is needed, down to a split second. The total cycle can be seconds or any number of hours.

An ATC Dial Timer available in 40 standard adjustable types



An 8-circuit Cam Timer used to control eight steps of a process

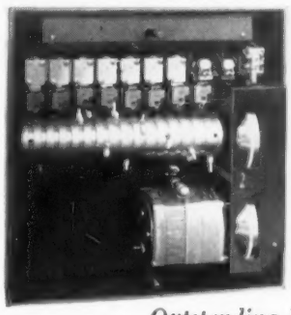
Send for BULLETIN G-10

Representatives in Principal Cities

AUTOMATIC TEMPERATURE CONTROL CO.
25 E. Logan St. Philadelphia, Pa.

Taylor

FLEX-O-TIMER
Time Cycle Controller



Precise, Fully Adjustable . . . Greatly simplifies *accurate* regulation of sequence and duration of various industrial processing operations.

Outstanding Features:

- Instantaneous Starting.
- Available for pneumatic or electric operations, or both.
- High capacity, low leak air valves—99½% efficient in utilizing air passing through; or all-metal mercury bottle switches.
- Snap-acting operators open or close air valves or switches instantaneously.
- Extremely flexible and adaptable to new or changing process requirements.
- Duration of cycle fully adjustable.
- Eliminates cam cutting.

Write for complete information and catalog to:

Taylor Instrument Companies
ROCHESTER, NEW YORK TORONTO, CANADA

TUBES, Pyrometer (Cont'd)
Norton Co.
Taylor Instrument Cos.
TUBES, Spectrum (See Spectrum Tubes)
TUBES, Ultra-Violet Light (See Ultra-Violet Light Sources)
TUBES, Vacuum
Arcturus Radio Tube Co.
Central Scientific Co.
Fredericks, George
General Elec. Co.
General Scientific Corp.
General Television Corp.
Raytheon Mfg. Co.
RCA Manufacturing Co.
Vacutron, Inc.
Wheelco Inst. Co.
TUBES, Venturi (See Flowmeters, Venturi)
TUBES, X-Ray
American Inst. Co.
Baird Associates
Corning Glass Works
General Electric X-Ray
Jarrell-Ash Co.
Kelley-Koett Mfg.
Westinghouse X-Ray Co.
Wyland, George
TUNING FORKS, Electrically Driven (See Forks, Tuning)
TURBIDIMETER
Akatos, Inc.
(Cont'd)

TURBIDIMETER (Cont'd)
American Inst. Co.
Cargille, R. P.
Central Scientific Co.
Eimer & Amend
Ess Instrument Co.
Fisher Scientific Co.
Hellige, Inc.
Klett Mfg. Co.
Kimble Glass Co.
Luxtrol Co., Inc.
Parr Instrument Co.
Pfaltz & Bauer, Inc.
Photoswitch, Inc.
Precision Scientific Co.
Rawson Electrical Inst.
Rubicon Co.
Sensitive Research Inst.
Zeiss, Inc., Carl

TURN & BANK INDICATORS
Kollsman Inst. Co.

TURN INDICATOR TESTERS (See Testers, Turn Indicator)

TWIST COUNTERS (See Counters, Twist)

ULTRA-VIOLET INDICATORS & RECORDERS
Gen. Elec. Lamp Dept.
Hanovia Chem. & Mfg.

U-TUBE MANOMETERS (See Manometers)

ULTRA-VIOLET LIGHT SOURCES (See Light Sources)

VACUUM GAGES, Hot-Wire
Baird Associates
Continental Elec. Co.
Fuess, Inc.
General Elec. Co.
Xervac Inst. Co.

VACUUM GAGES, Ionization
Fredericks, George
General Elec. Co.
General Television Corp.

VACUUM GAGES, Liquid-column
American Meter Co.
Bacharach Industrial Inst.
Defender Automatic Reg.
Dubrovin, John
Gas Appliance Specialties
Lantz-Phelps Corp.
Meriam Co.
Moeller Inst. Co.
Pioneer Instrument
Precision Term. & Inst.
Scientific Glass Apparatus
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Uehling Instrument Co.

VACUUM GAGES, McLeod
Ace Glass, Inc.
Central Scientific Co.
Eimer & Amend
General Elec. Co.
General Physical Lab.
Macalaster Bicknell Co.
Scientific Glass Apparatus
Welch Mfg. Co.

VACUUM GAGES, Pirani Type
Distillation Products

VACUUM, Indicators
American Meter Co.
Ashton Valve Co.
Bailey Meter Co.
Baird Associates
Bristol Co.
Brown Inst. Co.
Central Scientific Co.
Consol. Ashcroft Hancock
Eimer & Amend
Foxboro Co.
Fredericks, George
General Elec. Co.
Kollsman Inst. Co.
Marsh Corp.
Mason-Neilan Regulator
Moeller Instrument Co.
Pioneer Instrument
Potter Co.
Precision Therm. & Inst.
Rawson Electrical Inst.
Republic Flow Meters
Rochester Mfg. Co.
Scientific Glass Apparatus
Star Brass Mfg. Co.
(Cont'd)

VACUUM, Indicators (Cont'd)
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Uehling Instrument Co.

VACUUM, HIGH (below 1 mu) Controllers, Indicators & Recorders
Baird Associates
Continental Elec. Co.
Eimer & Amend
Electronic Prod. Co.
General Elec. Co.
General Physical Lab.
Welch Mfg. Co.

VACUUM RECORDERS
American Meter Co.
Ashton Valve Co.
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Consol. Ashcroft Hancock
Dickson Co.
Esterline-Angus Co.
Foxboro Co.
Fredericks, George
Marsh Corp.
Mason-Neilan Regulator
Republic Flow Meters
Scientific Instrument Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Uehling Instrument Co.

VACUUM SPECTROGRAPHS (See Spectrographs, Vacuum)

VACUUM TUBES (See Tubes, Vacuum)

VACUUM TUBE BRIDGES (See Bridges, Vacuum Tube)

VACUUM TUBE RELAYS (See Relays, Vacuum Tube)

VACUUM TUBE VOLTMETERS (See Voltmeters, Vacuum Tube)

VALVE BOX FINDER (See Finder, Valve Box)

VALVE-OPERATING DEVICES, Electric Motor
Baldwin-Southwark Corp.
Barber-Coleman Co.
Beck Co.
Brown Inst. Co.
Cramer & Co., Inc.
Cutler-Hammer, Inc.
Dickson Co.
Foxboro Co.
General Controls Co.
Hays Corp.
Illinois Eng. Co.
Jenkins Bros.
McAlear Mfg. Co.
Ruggles-Klingemann
Tagliabue Mfg. Co.

TIMERS

- **SINGLE OR MULTIPLE CONTACT CYCLE TIMERS**—Continuous repeat action or instantaneous reset types. Accurate timing adjustment of individual circuits and of complete cycle.
- **TIME DELAY RELAYS** — Thermostatically controlled or motor driven; for any voltage, any load, any application.
- **IMPULSE TIMERS**
- **CODE CONTACTORS**
- **FLASHERS**
- **SIGNAL CONTROLS**

BETTS & BETTS will enable you to check or set up all your operations from a central point.

Write for details and give details to save time.

BETTS & BETTS CORPORATION
THERMOSTATIC FLASHERS · MOTOR DRIVEN CONTROLS · SPECIAL TIMERS
551 WEST 52nd. STREET, NEW YORK, U.S.A.

For All **SCIENTIFIC** *Uses*

GALLET
GUINAND
and **SECURITY**

TIMERS

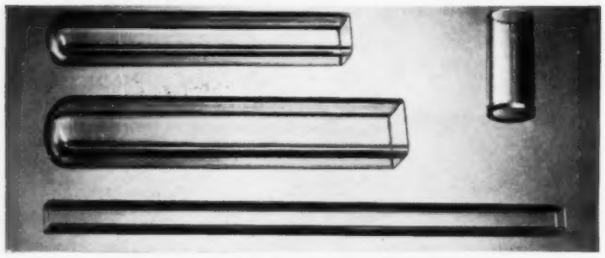
The Widest Selection of **TIMERS** and **CHRONOGRAPHS**
Best Quality in every Price Range

FREE *Catalog on request*

JULES RACINE & CO.
20 WEST 47th ST., NEW YORK

For addresses, see pages 66-76

PRECISION BORE TUBES
in PYREX and KIMBLE NC GLASS



Any diameter from 0.5 millimeters to 4.0 inches

Accuracy to 0.0002". Round, oval, square, hexagonal and octagonal. Also special shapes; see illustration below:

Special shape precision bore tube . . . each illustration is a section of the same tube. Note transition from round at one end to special fluted shape at other.

F·P ROTAMETERS

Used for viscometers, haemocytometers, optical cells, flowmeters, capillary tubes, rotameters, and other engineering and scientific purposes.

FISCHER & PORTER CO.
63 W. QUEEN LANE, PHILADELPHIA, PA.

METAL SHIELDED WIRE (PATENTED)

A NEW METHOD OF PROTECTING INSULATED WIRES

Seamless ALUMINUM or COPPER Tubing is Drawn over the Wire or Wires in such a manner that ANY kind of a bend can be made and the ends easily trimmed.

Gives Positive Protection to the Wire against Corrosion, Acids, Oils, etc. ★ Pliable, Compact, Light in Weight and Protects Mechanically like Armor. ★ Produces added Stiffness yet can be Bent to shortest Radii. ★ Outside Diameter can be held to close Tolerances and any required wall thickness can be made.

SEND FOR FREE SAMPLES

PRECISION TUBE CO.
Specialists in Accurately drawn Seamless ALUMINUM, COPPER and BRASS Tubing in the Smaller Sizes.
3824-26-28 TERRACE ST
PHILADELPHIA, PA.

VALVE OPERATING DEVICES, Electric Solenoid (See Valves, Solenoid)

VALVE OPERATING DEVICES, Hydraulic (See Valves, Hydraulically Operated)

VALVE-OPERATING DEVICES, Pneumatic (See Valves, Diaphragm)

VALVE POSITION INDICATORS
Autocall Co.
Automatic Temp. Control
Bailey Meter Co.
Beck Co.
Bendix Marine Products
Builders Iron Foundry
Consol. Ashcroft Hancock
Elec. Indicator Corp.
Elec. Tachometer Corp.
Foxboro Co.
General Regulator Corp.
Hanlon-Waters, Inc.
Northern Equip. Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Tefft-Jackson, Inc.

VALVES, Automatic Shut-off
Automatic Switch Co.
(Cont'd)

VALVES, Automatic Shut-off (Cont'd)
Automatic Valve Control.
Belfield Co.
Brown Inst Co.
Davis Reg. Co.
Fisher Governor Co.
Foster Engg. Co.
Frick Co.
Friez & Sons
General Controls Co.
General Sales & Prod.
Hanlon-Waters, Inc.
Jergusón Gage Co.
Kiely & Mueller
McAlear Mfg. Co.
McDonnell & Miller
Minneapolis-Honeywell
Partlow Corp.
Ruggles-Klingemann
Payne Furnace & Supply
Schade Valve Mfg. Co.
Tagliabue Mfg. Co.
Wilgus Mfg. Co.

VALVES, Automatic Solenoid
(See Valves, Solenoid)

VALVES, Balanced
American Meter Co.
Atlas Valve Co.
Bailey Meter Co.
Belfield Co.
(Cont'd)

VALVES, Balanced (Cont'd)
Boylston Co.
Bristol Co.
Cash Co.
Cochrane Corp.
Connelly Iron Sponge
Davis Reg. Co.
Defender Automatic Reg.
D'Este Co.
Fisher Governor Co.
Ford Reg. Valve Co.
Foster Engg. Co.
General Controls Co.
Hanlon-Waters, Inc.
Illinois Eng. Co.
Industrial Instrument
Jenkins Bros.
Kiely & Mueller
Klipfel Mfg. Co.
Mason-Neilan Regulator
McAlear Mfg. Co.
Minneapolis-Honeywell
Natural Gas Equipment
Northern Equip. Co.
Powers Regulator Co.
Republic Flow Meters
Reynolds Gas Regulator
Ruggles-Klingemann
Schade Valve Mfg. Co.
Spence Engineering Co.
Tagliabue Mfg. Co.
(Cont'd)

VALVES, Balanced (Cont'd)
Watts Regulator Co.
Wilgus Manufacturing

VALVES, Constant Pressure
Bailey Meter Co.
Belfield Co.
Cash Co.
Connelly Iron Sponge
Davis Reg. Co.
D'Este Co.
Dockson Co.
Fisher Governor Co.
Foster Engg. Co.
Hanlon-Waters, Inc.
Hoke, Inc.
Jenkins Bros.
Klipfel Mfg. Co.
Mason-Neilan Regulator
McAlear Mfg. Co.
Powers Regulator Co.
Refrigerating Spec. Co.
Reynolds Gas Regulator
Ruggles-Klingemann
Schade Valve Mfg. Co.
Spence Engineering Co.
Tagliabue Mfg. Co.
Vaughn-G E. Witt Co
Wilgus Manufacturing

VALVES, Diaphragm
Askania Regulator Co.
(Cont'd)

VALVES, Diaphragm (Cont'd)
Atlas Valve Co.
Bailey Meter Co.
Bastian-Blessing Co.
Belfield Co.
Boylston Co.
Bristol Co.
Brown Inst. Co.
Cash Co.
Connelly Iron Sponge
Consol. Ashcroft Hancock
Davis Reg. Co.
Defender Automatic Reg.
D'Este Co.
Fisher Governor
Foster Engg. Co.
Foxboro Co.
General Controls Co.
Hanlon-Waters, Inc.
Illinois Eng. Co.
Industrial Instrument
Johnson Service Co.
Kiely & Mueller
Klipfel Mfg. Co.
Leslie Co.
Mason-Neilan Regulator
McAlear Mfg. Co.
McCorkle Co.
Minneapolis-Honeywell
National Airoil Burner
Natural Gas Equipment
(Cont'd)

VALVES, Diaphragm (Cont'd)
Partlow Corp.
Payne Furnace & Supply
Powers Regulator Co.
Refrigerating Spec. Co.
Republic Flow Meters Co.
Reynolds Gas Regulator
Ruggles-Klingemann
Schade Valve Mfg. Co.
Scientific Instrument Co.
Spence Engineering Co.
Spencer Thermostat Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Vaughn-G. E. Witt
White-Rodgers Electric
Wilgus Manufacturing

VALVES, Electrically Operated
Atkins & Co.
Atlas Valve Co.
Automatic Products Co.
Automatic Switch Co.
Automatic Temp. Control
Bristol Co.
Brown Inst. Co.
Cochrane Corp.
Cutler-Hammer, Inc.
Davis Reg. Co.
Defender Automatic Reg.
Detroit Lubricator Co.
Electric Valve Mfg.
Electrimatic Corp.
Foster Engg. Co.
Foxboro Co.
Frick Co.
Friez & Sons
General Controls Co.
Hannifin Mfg. Co.
Hunt & Son
Illinois Eng. Co.
Jenkins Bros.
Kiely & Mueller
Klipfel Mfg. Co.
Leslie Co.
Magnatrol Valve Corp.
Mason-Neilan Regulator
McAlear Mfg. Co.
McCorkle Co.
McDonnell & Miller
Minneapolis-Honeywell
Northern Equipment Co.
Payne Furnace & Supply
Penn Electric Switch
Perfex Corp.
Refrigerating Spec. Co.
Ruggles-Klingemann
Schade Valve Mfg. Co.
Shafteross Mfg. Co.
Spence Engineering Co.
Supreme Elec. Prods.
Tagliabue Mfg. Co.
White-Rodgers Elec. Co.

VALVES, Hydraulically Operated
Area Regulators, Inc.
Askania Regulator
Atlas Valve Co.
Auto. Temp. Control
Bailey Meter
Barber-Coleman Co.
Cash Co.
Controls, Inc.
Defender Automatic Reg.
Fisher Governor
Foster Engg. Co.
Gen. Electric Co.
Hays Corp.
Jenkins Bros.
Kiely & Mueller
Leslie Co.
Mason-Neilan Regulator
McAlear Mfg. Co.
Powers Regulator Co.
Republic Flow Meter
Ruggles-Klingemann
Schade Valve Mfg. Co.
Spence Engineering Co.
Sterling Eng. Co.

VALVES, Lubricated Plug
Merco Nordstrom Valve

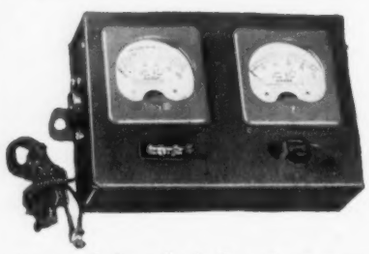
VALVES, Motor Operated
(See Valves, Diaphragm; Valves, Electrically-operated; Valves, Hydraulically - operated; Valves, Solenoid)

Taylor

"MOTO-STEEL"
EVENACTION DIAPHRAGM VALVES

Write for complete information and catalogs.

Taylor Instrument Companies
ROCHESTER, N.Y. TORONTO, CANADA



TRU-VAC
VACUUM GAUGES
(PIRANI TYPE)

Shown at left is meter box of our model No. 6 gauge.

This gauge successfully used by many of America's foremost manufacturers.

Send for circular on our new low priced D.C. operated gauge.

CONTINENTAL ELECTRIC CO.
GENEVA, ILLINOIS

RESERVED FOR

TELEVISO COMPANY, 2400 N. SHEFFIELD AVE., CHICAGO, ILL.

MANUFACTURERS OF

ELECTRONIC PRODUCTS—CUSTOM-BUILT EQUIPMENT

VALVES, Pressure Relief, Reducing, etc.
Abercrombie Pump Co.
American Meter Co.
Ashton Valve Co.
Atlas Valve Co.
Bailey Meter Co.
Bastian-Blessing Co.
Boylston Co.
Brown Instr. Co.
Cash Co.
Cochrane Corp.
Connelly Iron Sponge
Consol. Ashcroft Hancock
Crosby Steam Gage Co.
Davis Reg. Co.
D'Este Co.
Detroit Lubricator Co.
Fisher Governor Co.
Foster Engg. Co.
Foxboro Co.
Fulton Sylphon Co.
Hagan Corp.
Hanlon-Waters, Inc.
Hoke, Inc.
Illinois Eng. Co.
Industrial Instrument
Kenyon Instrument Co.
Kiely & Mueller
Klipfel Mfg. Co.
Lammert & Mann Co.
Leslie Co.
Marsh Corp., Jas. P.
Mason-Neilan Regulator
McAlear Mfg. Co.
Minneapolis-Honeywell
Natural Gas Equipment
Powers Regulator Co.
Republic Flow Meters
Ruggles-Klingemann
Schade Valve Mfg. Co.
Spence Engineering Co.
Spencer Thermostat Co.
Star Brass Mfg. Co.
Tagliabue Mfg. Co.
Taylor Instr. Cos.
Vapor Recovery Systems
Vaughn-G. E. Witt Co.
Victor Equipment Co.
Watts Regulator Co.
Wilgus Manufacturing

VALVES, Proportional Air-Gas
American Meter Co.
Bristol Co.
Brown Inst. Co.
Cash Co.
Connelly Iron Sponge
Fisher Governor Co.
Hanlon-Waters, Inc.
Lammert & Mann Co.
Mason-Neilan Regulator
McAlear Mfg. Co.
Tagliabue Mfg. Co.

VALVES, Regulating
Am. Gas Furnace Co.
American Meter Co.
Arco Regulators, Inc.
Atlas Valve Co.
Automatic Valve Control
Bailey Meter Co.
Bastian-Blessing Co.
Belfield Co.
Boylston Co.
Boilerr Room Equipment
Bristol Co.
Brown Inst. Co.
Cash Co.
Cochrane Corp.
Connelly Iron Sponge
Consol. Ashcroft Hancock
Davis Reg. Co.
Defender Automatic Reg.
D'Este Co.
Dockson Co.
Electromatic Corp.
Fisher Governor Co.
Ford Reg. Valve Co.
Foster Engg. Co.
Foxboro Co.
Friez & Sons
Fulton Sylphon Co.
General Controls Co.
Hagan Corp.
Hanlon-Waters, Inc.
Hannifin Mfg. Co.
Illinois Eng. Co.
Jenkins Bros.
Kiely & Mueller
Klipfel Mfg. Co.
Lammert & Mann Co.
Leslie Co.
Mason-Neilan Regulator
McAlear Mfg. Co.
Minneapolis-Honeywell
National Airoil Burner
Natural Gas Equipment
(Cont'd)

Constant Voltage

FOR YOUR LABORATORY, YOUR PRODUCT, OR YOUR PRODUCTION LINE

UTC STEADI-VOLT

- ACCURACY 1%
- INDEPENDENT OF LOAD
- NO MOVING PARTS
- HIGH POWER FACTOR
- HIGH EFFICIENCY
- NEGLIGIBLE TIME CONSTANT
- LOW DISTORTION
- LOW TEMPERATURE RISE

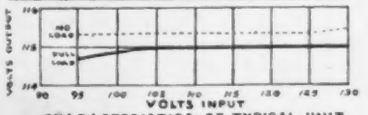
AUTOMATIC VOLTAGE REGULATORS

95-130 VOLT INPUTS . . . 110, 115, 120 VOLTS OUTPUT ± 1%

The UTC automatic voltage regulator is NEW. It involves no moving parts and effects instantaneous correction for either transient or chronic line voltage fluctuations.

STANDARD TYPES

Type No.	Capacity VA — 60 Cyc.	Net Price
AR-1	15	$12.00
AR-2	30	15.00
AR-3	60	21.00
AR-4	120	28.00
AR-5	250	46.00
AR-6	500	67.00
AR-7	1000	110.00
AR-8	2000	200.00



CHARACTERISTICS OF TYPICAL UNIT

Designs for 220 volt service available at 25% increase in price. For 50 cycle units increase price 25%; for 42 cycles, 35% increase; for 25 cycles, increase price 100%. Special secondary voltages available to customers' specifications at small increase in price.

SPECIAL UNITS

The unique design of these regulators makes possible the construction of special units with relative ease. The output can be arranged to provide filament and plate voltage, or any other special voltages that may be required. Write for details.

UNITED TRANSFORMER CORP.

150 VARICK STREET ★ NEW YORK, N. Y.

EXPORT DIVISION: 100 VARICK STREET NEW YORK, N. Y. CABLES: "ARLAB"

For addresses, see pages 66-76

"Piezo-Ray"

(A trade name)

The Best in Electronic Equipment for Engine Pressures and Vibrations

THE PIEZO-RAY CABINET FOR HOUSING PIEZO-RAY UNITS

The most complete equipment ever offered for studying Diesel and gasoline engine pressures, torsional, linear, and planar vibrations.

NEW PIEZO-RAY UNITS

TYPE IV TORSIONAL VIBRATION UNITS

DUPLEX POLAR DIAGRAM AMPLIFIERS

PLANAR VIBRATION PICKUP UNITS

ELECTRONIC SWITCHES (RCA)

DISPLACEMENT METERS (Torsional and Linear)

TYPE II VIBRATION OUTPUT INTEGRATORS

CEL Type VI Air Flow Indicators, Single and Multiple Stage Fuel Flow Indicators, Single and Multiple Direct Pressure Engine Indicators, Magnetic Wall Thickness Gages, and other Special Laboratory Instruments are internationally used.

COMMERCIAL ENGINEERING LABORATORIES

Manufacturers of

Precision Testing Instruments

SINCE 1912

4612 Woodward Ave. Detroit, Mich.

VALVES, Regulating (Continued)
Northern Equipment Co.
Partlow Co.
Parr Inst. Co.
Powers Regulator Co.
Republic Flow Meters
Robertshaw Thermostat
Ruggles-Klingemann
Schade Valve Mfg. Co.
Spence Engineering Co.
Tagliabue Mfg. Co.
Taylor Inst. Cos.
Vaughn-G. E. Witt
Victor Equipment Co.
Wilgus Manufacturing

VALVES, Safety Fuel Shut-off
American Meter Co.
Askania Regulator Co.
Atlas Valve Co.
Automatic Products Co.
Automatic Switch Co.
Bristol Co.
Brown Inst. Co.
Cash Co.
Davis Reg. Co.
D'Este Co.
Detroit Lubricator Co.
Eclipse Fuel Engg. Co.
Fisher Governor
Friez & Sons
Fulton Sylphon Co.
General Combustion Corp.
General Controls Co.
Hanlon-Waters, Inc.
Johnston & Jennings Co.
Mason-Neilan Regulator
McAlear Mfg. Co.
McDonnell & Miller
Milwaukee Gas Specialty
Minneapolis-Honeywell
National Airoil Burner
Natural Gas Equipment
Partlow Corp.
Payne Furnace & Supply
Penn Electric Switch
Preferred Utilities Mfg.
Ruggles-Klingemann
Spence Engineering Co.
Spencer Thermostat Co.
Tagliabue Mfg. Co.
Viking Instrument Co.
Wilgus Manufacturing

VALVES, Solenoid
Atkins & Co.
Atlas Valve Co.
Automatic Products Co.
Automatic Switch Co.
Barber-Coleman Co.
Brown Inst. Co.
Cutler-Hammer, Inc.
Davis Reg. Co.
Detroit Lubricator Co.
Electric Valve Mfg. Co.
Electrimatic Corp.
Foxboro Co.
Frick Co.
Friez & Sons
General Controls Co.
Gen. Elec. Co.
General Sales & Prod.
Guardian Elec. Mfg.
Hannifin Mfg. Co.
Hays Corp.
Hunt & Co.
Leslie Co.
Magnatrol Valve Corp.
McDonnell & Miller
Minneapolis-Honeywell
Northern Equip. Co.
Partlow Corp.
Penn Electric Switch
Perfex Corp.
Refrigerating Spec. Co.
Ruggles-Klingemann
Schade Valve Mfg. Co.
Spence Engineering Co.
Sterling Eng. Co.
Supreme Elec. Prods.
Tagliabue Mfg. Co.

VALVES, Thermostat (See Thermostats)

VEHICLE TRAVEL RECORDERS
Commercial Engg. Labs.
Cramer & Co.
Elec. Tachometer Corp.
Knopf, Paul
Ohmer Register Co.
Pittsburgh Taximeter Co.
Service Recorder Co.

VENTURI METERS (See Flowmeters, Venturi)

VENTURI TUBES (See Flowmeters, Venturi)

VIBRATION PICKUPS
Amperite Co.
Brush Development Co.
Electrical Research Prod.
Miller Corp., Wm.
Shure Brothers

VIBROGRAPHS
American Askania Corp.
Baldwin-Southwark Corp.
Cambridge Inst. Co.
Central Scientific Co.
Chicago Apparatus Co.
Commercial Engg. Labs.
Impact Register Co.
RCA Manufacturing Co.
Ruska & Co.

VIBROMETERS
American Askania Corp.
American Inst. Co.
Ballantine Labs.
Electrical Research Prod.
Electrocon Corp.
Helland Research Corp.
Miller Corp., Wm.
Potter Co.
Ruska & Co.
Suter, Alfred
Televiso Co.

VIBROSCOPES
Amperite Corp.
Commercial Engg. Labs.
Ruska & Co.

VICAT NEEDLES (See (See Needles, Vicat)

VISCOSIMETER BATHS, Constant-temperature
Brabender Corp.
Central Scientific Co.
Fish-Schurman Corp.
Fisher Scientific Co.
Precision Scientific Co.
Ruska & Co., Inc.
Sargent & Co., E. H.
Scientific Glass App.
Tagliabue Mfg. Co., C. J.
Thomas Co., Arthur H.

VISCOSIMETERS, Brookfield
Brookfield Eng. Labs.

VISCOSIMETERS, Engler
American Inst. Co.
Boekel & Co.
Central Scientific Co.
Humboldt Mfg. Co.
Precision Scientific Co.
Ruehfel Co.

VISCOSIMETERS, Fenske
American Inst. Co.

VISCOSIMETERS Ford (For Paint)
Central Scientific Co.
Eimer & Amend
Scientific Inst. Co.

VISCOSIMETERS, Hoepler
Central Scientific Co.
Fish-Schurman Co.
Sargent & Co.

VISCOSIMETERS, Kinematic
Eimer & Amend

VISCOSIMETERS, MacMichael
Eimer & Amend

VISCOSIMETERS, Recording
Binckley, G. S.
Brabender Corp.
Esterline-Angus Co.

VISCOSIMETERS, Redwood
American Inst. Co.
Ruehfel Co.

VISCOSIMETERS, Saybolt
American Inst. Co.
Boekel & Co.
Central Scientific Co.
Corning Glass Works
Humboldt Mfg. Co.
Kimble Glass Co.
Precision Scientific Co.
Ruehfel Co.
Tagliabue Mfg. Co.
Visco-Meter Corp.
Zuhr, Inc., Henry

VISCOSIMETERS, Scott
Boekel & Co.
Central Scientific Co.
Precision Scientific Co.
Ruehfel Co.
Sargent & Co.

VISCOSIMETERS, Stormer
Central Scientific Co.
Industro-Scientific Co.
Thomas Co., Arthur H.

VISCOSIMETERS, Ubbelohde
American Inst. Co.
Central Scientific Co.
Fish-Schurman Co.
Sargent & Co.

VISCOSIMETERS, Zahn
General Elec. Co.

VISCOSITY REGULATORS (See Controllers, Automatic, Viscosity)

VISCOSITY TUBES
Cargille, R. P.

VOLTAGE ADJUSTERS, AUTOMATIC
General Elec. Co.
Ideal Commutator Dresser
Roller-Smith Co.
Sola Electric Co.
United Transformer Corp.

VOLTAGE DETECTORS (See Detectors, Voltage)

VOLTAGE DIVIDERS, Radio Frequency (See Dividers, Voltage)

VOLTAGE, HIGH (above 2300 volts) **Indicators**
General Elec. Co.
General Physical Lab.
Ideal Commutator Dresser
Rawson Electrical Inst.
Roller-Smith Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
Triplett Electrical Inst.
Weston Elec. Inst. Corp.

VOLTAGE, HIGH (above 2300 volts) **Measuring Devices**
Associated Research
General Elec. Co.
International Resistance
Roller-Smith Co.
Sensitive Research Inst.
Westinghouse Elec. & Mfg.
Westinghouse X-Ray Co.
Weston Elec. Inst. Corp.

FOXBORO

Reg. U. S. Pat. Off.

VALVES

Foxboro valves for air-operated controllers should be specified with Foxboro Controllers – because the characteristic of the Valve should fit the characteristic of the instrument. The Valve is a vital part of a Control installation. The Foxboro line is engineered to assure the best results.

For complete information write for Bulletin No. 214-2. **The Foxboro Company, 46 Neponset Avenue, Foxboro, Massachusetts, U. S. A.** Branch offices in principal cities of the United States and Canada.

Fused for Safety

WINSLOW PORTABLE INSTRUMENTS

Complete line—AC — DC — Thermal
High degree of accuracy
Rugged construction
Attractive design
Dependable performance
Moderately priced

Write for bulletin P-10-1

THE WINSLOW COMPANY

NINE LIBERTY ST. NEWARK, N. J.

RECORDING VISCOSITY WITH AUTOMATIC CONSTANT-SPEED TEMPERATURE INCREASE

THE VISCOGRAPH

Recording Viscosimeter, with the following novel features:

1—Automatic constant speed temperature increase—from room temperature to 150°C.

2—Constant temperature, adjustable to any point within the above range. The Viscosity is recorded continuously by means of a curve.

The VISCOGRAPH has been applied successfully in the testing of:

Oil	Glue	Artificial Silk
Printing Ink	Dextrin	Starch
Latex		Flour, etc.

Brabender Corporation Rochelle Park, New Jersey

For addresses, see pages 66-76

VIBRATION *can be isolated*

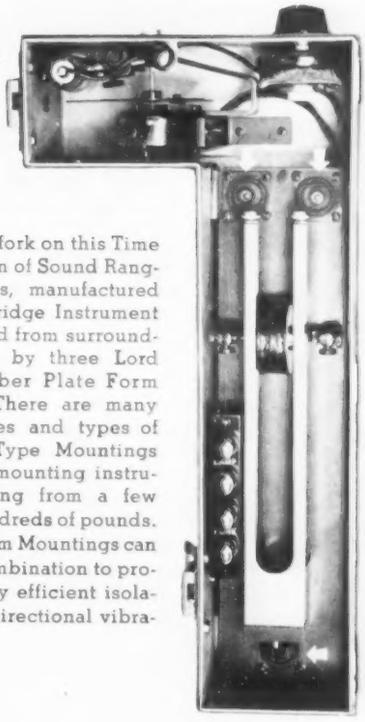
USE LORD BONDED RUBBER SHEAR TYPE MOUNTINGS TO MAINTAIN THE ACCURACY OF YOUR INSTRUMENTS UNDER VIBRATION AND SHOCK

When properly designed into an instrument, Lord Shear Type Mountings will localize and isolate any vibration that would otherwise affect the operating accuracy of the instrument.

The effectiveness of these mountings is based on the fact that rubber when stressed in shear deflects more readily than when under direct tension or compression. In applying this principle Lord has perfected many varieties of bonded rubber mountings that provide unusual radial stability and axial elasticity.

Panels, sub-panels and individual instruments can be protected from vibration and shock regardless of their size or weight, or the frequencies of the disturbing vibrations.

Our engineering department has solved hundreds of vibration problems for designers and manufacturers of instruments. This extensive knowledge of vibration engineering is available to you.



The tuning fork on this Time Marker System of Sound Ranging Apparatus, manufactured by the Cambridge Instrument Co., is isolated from surrounding vibration by three Lord Bonded Rubber Plate Form Mountings. There are many different styles and types of Lord Shear Type Mountings available for mounting instruments weighing from a few ounces to hundreds of pounds. Lord Plate Form Mountings can be used in combination to provide extremely efficient isolation of multi-directional vibratory forces.

PLAN VIEW

LORD MANUFACTURING COMPANY . . . ERIE, PA.

923 FAIRMOUNT ROAD, BURBANK, CAL. 280 MADISON AVE., NEW YORK 332 S. MICHIGAN AVE., CHICAGO

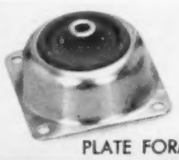
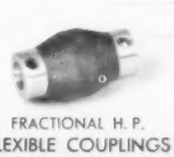


PLATE FORM MOUNTINGS

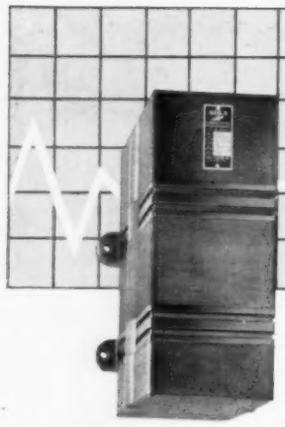
LORD
BONDED RUBBER
SHEAR TYPE
VIBRATION
MOUNTINGS

TUBE FORM MOUNTINGS



FRACTIONAL H. P.
FLEXIBLE COUPLINGS

IT TAKES RUBBER IN SHEAR TO ISOLATE VIBRATION



CONSTANT VOLTAGE

FOR YOUR LABORATORY . . . FOR YOUR PRODUCTION LINE . . . OR INCORPORATED IN YOUR PRODUCTS

Whether it's 1 VA for an instrument or 10 KVA for a production line—if your needs call for stable voltage at all times, SOLA CONSTANT VOLTAGE TRANSFORMERS will deliver for you.

Fully automatic, instantaneous in operation, SOLA CONSTANT VOLTAGE TRANSFORMERS have no moving parts and require no maintenance. They are self-protecting and cannot be damaged by short circuit. AND—they will maintain their output voltage to within a fraction of a percent of the specified value, even though the line voltage varies *as much as thirty percent.*

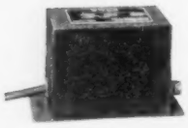
You can build a SOLA CONSTANT VOLTAGE TRANSFORMER into your product and stop worrying about your customer's line voltage. There will be no burn-outs from over-voltage, no operating failures due to under-voltage and no erratic performance resulting from line transients.

You can build a SOLA CONSTANT VOLTAGE TRANSFORMER into your production line or your laboratory and know that every test will be made under the same line conditions, that those conditions will not change from the start of your test to its finish, and, above all, that if a short circuit occurs, there will be no fires, no ruined transformer, no blown fuses.

You'll find these SOLA CONSTANT VOLTAGE TRANSFORMERS surprisingly compact—and economical, too. To augment or replace non-regulating types, standard designs are available, or units can be built to your special specification. So—whether it's 1 VA for an instrument or 10 KVA for a production line—make it a SOLA and be sure! Our engineers will assist you in selecting the type best suited to your needs. *Write for Bulletin GCV-22.*

For capacities above 200 VA. Housing type.

From 20—200 VA. Primary cord set, and output receptacle.



A new unit for applications up to 15 VA. Equipped with leads or terminals.

SOLA

SOLA ELECTRIC CO. 2525 Clybourn Chicago, Illinois

VOLTAGE, HIGH (above 2300 volts) Testing Devices
American Transformer
Associated Research
General Elec. Co.
Ideal Commutator Dresser
International Resistance
Miller Co., Bertrand F.
Raytheon Mfg. Co.
Roller-Smith Co.
States Co.
Superior Elec. Co.
United Transformer Corp.
Weston Elec. Inst. Corp.

VOLTAGE REGULATORS (See Regulators, Automatic, Voltage)

VOLT-AMMETERS
Am. Elec. Sales Co.
Clough-Brengle Co.
De Jur-Amsco Corp.
Esterline-Angus Co.
General Elec. Co.
Hickok Elec. Inst. Co.
RCA Manufacturing Co.
Rawson Electrical Inst.
Reliance Instrument Co.
(Cont'd)

VOLT-AMMETERS
(Continued)
Roller-Smith Co.
Sensitive Research Inst.
Supreme Instruments
Therm-Electric Meters Co.
Triplett Electrical Inst.
Welch Mfg. Co.
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.

VOLT-AMPERE-HOUR METERS
Ferranti Electric, Inc.
General Electric Co.

VOLTMETERS, Contact Making
Burton-Rogers Co.
Electronic Laboratory
Electric Tachometer Corp.
Engineering Labs., Inc.
Esterline-Angus Co.
Ferranti Electric, Inc.
General Electric Co.
Geophysical Instrument Co.
Hickok Electrical Inst.
Reliance Instrument Co.
Roller-Smith Co.
Ruska & Co., Inc.
Weston Electrical Inst.

VOLTMETERS, Electrostatic
Cambridge Inst. Co.
Ferranti Electric, Inc.
General Elec. Co.
Hathaway Inst. Co.
Rawson Electrical Inst.

VOLTMETERS, Indicating
Ballantine Labs.
Burton-Rogers Co.
Clough-Brengle Co.
Columbia Elec. Mfg.
De Jur-Amsco Corp.
Ferranti Electric, Inc.
General Elec. Co.
Hickok Elec. Inst. Co.
Niagara Electrical Inst.
Norton Electrical Inst.
Precision Apparatus Corp.
Radio City Products Co.
Rawson Electrical Inst.
RCA Manufacturing Co.
Roller-Smith Co.
Sensitive Research Inst.
Simpson Elec. Co.
Triumph Mfg. Co.
Welch Mfg. Co.
Westinghouse Elec. & Mfg.
Weston Elec. Inst Corp.
Winslow Co.

VOLTMETERS, Megohm
Associated Research
Jackson Electrical Inst.
Rawson Electrical Inst.
RCA Manufacturing Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
Sticht & Co.
Televiso Co.
Welch Mfg. Co.
Weston Elec. Inst. Corp.

VOLTMETERS, Micro
Cambridge Inst. Co.
De Jur-Amsco Corp.
Hickok Elec. Inst. Co.
Microvolts, Inc.
Rawson Electrical Inst.
Sensitive Research Inst.
Supreme Instruments
Televiso Co.
Triplett Electrical Inst.
Weston Elec. Inst. Corp.
Wheelco Inst. Co.

VOLTMETERS, Micro, Radio Frequency
Ferris Inst. Corp.

VOLTMETERS, Millivoltmeters
Ballantine Labs.
Bristol Co.
Burton-Rogers Co.
Cambridge Inst. Co.
De Jur-Amsco Corp.
Engelhard, Chas.
Esterline-Angus Co.
Etna Elec. Works
General Elec. Co.
Hickok Elec. Inst. Co.
Radio City Products Co.
Rawson Electrical Inst.
Roller-Smith Co.
Sensitive Research Inst.
Simpson Elec. Co.
Southw'n Electronics Labs
Tagliabue Mfg. Co.
Thwing-Albert Inst. Co.
Triplett Electrical Inst.
Welch Mfg. Co.
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.
Wheelco Inst. Co.

VOLTMETERS, Oxide Rectifier
Clough-Brengle Co.
De Jur-Amsco Corp.
General Elec. Co.
General Radio Co.
Hickok Elec. Inst. Co.
Radio City Products Co.
Roller-Smith Co.
Simpson Elec. Co.
Supreme Instruments
Triplett Electrical Inst.
Triumph Mfg. Co.
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.

VOLTMETERS, Peak
Clough-Brengle Co.
General Elec. Co.
Hickok Elec. Inst. Co.
RCA Manufacturing Co.
Sensitive Research Inst.

VOLTMETERS, Recording
Bristol Co.
Cambridge Inst. Co.
Engelhard, Chas.
Esterline-Angus Co.
General Elec. Co.
Leeds & Northrup Co.
Roller-Smith Co.
Westinghouse Elec. & Mfg.

VOLTMETERS, Thermionic Rectifier
Andrew, Victor J.
Cambridge Inst. Co.
General Radio Co.
Measurements Corp.

VOLTMETERS, Thermo
Am. Elec. Sales Co.
Cambridge Inst. Co.
De Jur-Amsco Corp.
Etna Elec. Works
General Elec. Co.
Hickok Elec. Inst. Co.
Rawson Electrical Inst.
Sensitive Research Inst.
Triplett Electrical Inst.
Weston Elec. Inst. Corp.
Wheelco Inst. Co.

VOLTMETERS, Vacuum Tube
Andrew, Victor J.
Ballantine Labs.
Cambridge Inst. Co.
Clough-Brengle Co.
Fisher Scientific Co.
General Elec. Co.
General Radio Co.
Jones-Orme Co.
Luxtrol Co., Inc.
Measurements Corp.
Microvolts, Inc.
Radio City Products Co.
Reliance Instrument Co.
Televiso Co.
Triplett Electrical Inst.
Triumph Mfg. Co.
Weston Elec. Inst. Corp.
Shallcross Mfg. Co.

VOLT-OHMMETERS
Clough-Brengle Co.
De Jur-Amsco Corp.
Hickok Elec. Inst. Co.
Jackson Electrical Inst.
Precision Apparatus Corp.
Radio City Products Co.
Rawson Electrical Inst.
RCA Manufacturing Co.
Roller-Smith Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
Simpson Elec. Co.
Triplett Electrical Inst.
Triumph Mfg. Co.
Welch Mfg. Co.
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.

VOLUME CONTROLS
Arca Regulators
Clarostat Mfg. Co.
General Radio Co.
International Resistance

VOLUME INDICATORS Sound
Daven Co.
General Radio Co.

WATCHES, Chronometer
Bliss & Co.
Burke, Louis
Clebar Watch Co.
Jaeger Watch Co.
Jardur Import Co.
Negus, T. S. & J. D.
Pastor Stop Watch
Stillman Co.

WATCHES, Stop
Aristo Import Co.
Burke, Louis
Central Scientific Co.
Clebar Watch Co.
Ducommun Co.
Elec. Facilities, Inc.
Fish-Schurman Co.
Fisher Scientific Co.
Gaertner Scientific Corp.
Jaeger Watch Co.
Jardur Import Co.
Meylan, A. R. & J. E.
Negus, T. S. & J. D.
Pastor Stop Watch Co.
Pierce Watch Co.
Racine & Co., Jules
Scherr Co., Inc.
Sneidel & Co.
Stillman Co.
Tagliabue Mfg. Co.
Testrite Instrument Co.
Zernickow Co., O.

WATCHES, Stop-Electric
Central Scientific Co.
Elgin Natl. Watch Co.
Jaeger Watch Co.
Meylan, A. R. & J. E.
Stillman Co., M. J.
Tagliabue Mfg. Co.
Thompson Clock Co.

WATER ANALYSIS OUTFITS
Taylor & Co., Inc.

WATER BATHS, Constant Temperature
Elec. Heat Control App.

WATER FEEDERS, AUTOMATIC
Bailey Meter Co.
Henszey Co.
Mason-Neilan Regulator
McAlear Mfg. Co.
McDonnell & Miller
Merrit Eng. & Sales Co.
Northern Equip. Co.

WATER METERS (See Liquid Meters)

WATER METER TESTERS (See Testers, Water Meter)

WATER & SEDIMENT APPARATUS
Central Scientific Co.
Davis Reg. Co.
McAlear Mfg. Co.
Precision Scientific Co.
Ruska & Co.
Tagliabue Mfg. Co.
Thomas Co., Arthur H.

WATTHOUR METERS
General Elec. Co.
Westinghouse Elec. & Mfg.

WATTMETERS, Electrostatic
Sensitive Research Inst.

WATTHOUR METER TESTERS (See Testers, Watthour Meter)

WATTMETER, Indicators
Autocall Co.
General Elec. Co.
Hickok Elec. Inst. Co.
Norton Electrical Inst.
Rawson Electrical Inst.
Reliance Instrument Co.
Roller-Smith Co.
Sensitive Research Inst.
Therm-Electric Meters Co.
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.

WATTMETER, Recorders
Bristol Co.
Esterline-Angus Co.
General Elec. Co.
Roller-Smith Co.
Sensitive Research Inst.
Therm-Electric Meters Co.
Westinghouse Elec. & Mfg.

WAVE METERS
Andrew, Victor J.

WAX MELTING APPARATUS
Central Scientific Co.
Fisher Scientific Co.
Precision Scientific Co.
Tagliabue Mfg. Co.

WEATHEROMETER
Atlas Elec. Devices Co.

WEIGHT INDICATORS, Automatic Recording
Exact Weight Scale Co.
Howe Scale Co.
Martin Decker Corp.
Roller-Smith Co.
Streeter-Amet Co.
Toledo Scale Co.

WEIGHING MACHINES (See various headings under "Scales—")

WEIGHTS, Analytical
Ainsworth & Sons
Becker, Inc., Christian
Central Scientific Co.
Exact Weight Scale Co.
Fisher Scientific Co.
Gurley, W. & L. E.
Howe Scale Co.
Newark Scale Works
Pfaltz & Bauer, Inc.
Seederer-Kohlbusch, Inc.

WEIGHTS, Analytical (Cont'd)
Suter, Alfred
Thomas Co., Arthur H
Torsion Balance Co.
Troemner, Henry
Voland & Sons, Inc.
Welch Mfg. Co.

For addresses, see pages 66-76

For Voltage Measurement

● ***D.C. Voltmeter:***

Stabilized, balanced, degenerative amplifiers eliminate "zero drift"—no change of zero with range selection. Polarity reversal switch. Linear scale calibration. Meter not damaged by severe overload.

● ***A.C. Voltmeter:***

Balanced diode circuit reduces zero drift. Compact, low-loss, low-capacity probe designed for accurate measurement for frequencies from 30 cycles to over 150 megacycles. Built-in blocking condenser to remove d.c. component. Calibrated to read r.m.s. values of a sine-wave or 71% of the peak value of a complex wave.

● ***Specifications:***

Ranges: Push button selection of five ranges, 1, 3, 10, 30, and 100 volts full scale either a.c. or d.c.

Accuracy: 2% of full scale on each range either a.c. or d.c.

Power Supply: 115 volts, 60 cycles—no batteries.

Dimensions: 4¾" wide, 6" high, and 8½" deep.

Weight: Approximately six pounds.

Price: $135.00 f.o.b. Boonton, N. J.

MEASUREMENTS CORPORATION

BOONTON NEW JERSEY

STABILIZED VOLTAGE

RAYTHEON VOLTAGE STABILIZERS

U. S. Patents 1,985,034 and 1,985,035

are magnetic devices, without moving parts or adjustments, which automatically stabilize AC voltages to plus or minus 1½%

SOME BENEFITS OF STABILIZED VOLTAGE

Factory Test Equipment—eliminates manual voltage adjustments
Amplifiers and Rectifiers—makes AC fluctuations unimportant
Laboratories—holds AC voltage constant during tests
Photo-cell Light sources—stabilizes illumination
X-ray Tubes—holds filament emission constant
Pirani Gauges—permits AC operation

WRITE FOR NEW Bulletin DL 48-71141

RAYTHEON MFG. CO.

WALTHAM, MASS.

VOLTMETERS

—and instruments for all electrical measurement needs

All the types, sizes, ranges and operating specifications necessary for laboratory, switchboard and maintenance requirements. Consult the WESTON specialist in your vicinity on any instrument problem. Bulletins available. Weston Electrical Instrument Corporation, 591 Frelinghuysen Ave., Newark, New Jersey.

WESTON *Instruments*

WEIGHTS, Avoirdupois
Becker, Inc., Christian
Central Scientific Co.
Exact Weight Scale Co.
Gurley, W. & L. E.
Howe Scale Co.
Newark Scale Works
Seederer-Kohlbusch, Inc.
Suter, Alfred
Torsion Balance Co.
Troemner, Henry
Voland & Sons, Inc.

WEIGHTS, Metric
Ainsworth & Sons
Becker, Inc., Christian
Central Scientific Co.
Chicago Apparatus Co.
Exact Weight Scale Co.
Gaertner Scientific Corp.
Gurley, W. & L. E.
Keller Mfg. Co.
Newark Scale Works
Seederer-Kohlbusch, Inc.
Suter, Alfred
Toledo Scale Co.
Torsion Balance Co.
Troemner, Henry
Voland & Sons, Inc.
Welch Mfg. Co.

WEIGHTS, Test (See Weights, Avoirdupois, Metric or Troy)

WEIGHTS, Troy
Becker, Inc., Christian
Central Scientific Co.
Exact Weight Scale Co.
Gurley, W. & L. E.
Howe Scale Co.
Newark Scale Works
Seederer-Kohlbusch, Inc.
Torsion Balance Co.
Troemner, Henry

WEIGHTS & MEASURES, PRECISION STANDARDS
Becker, Inc., Christian
Gurley, W. & L. E.
Jacobs Bros. Co.
Pfaltz & Bauer, Inc.
Seederer-Kohlbusch, Inc.
Torsion Balance Co.
Troemner, Henry

WEIR METERS (See Flowmeters, Weir)

WIND DIRECTION & VELOCITY INDICATORS
Binckley, G. S.
Electric Speed Ind. Co.
Elec. Tachometer Corp.
Friez & Sons
General Elec. Co.
Geophysical Inst. Co.
Green, Henry J.
Kenyon Instrument Co.
Southw'n Electronics Labs

WIND DIRECTION & VELOCITY RECORDERS
Binckley, G. S.
Elec. Tachometer Corp.
Esterline-Angus Co.
Friez & Sons
Geophysical Instrument
Green, Henry J.
Kenyon Instrument Co.
Leeds & Northrup Co.
Zeiss, Inc., Carl

WIND GAGES (See Gages, Wind)

WIRE, Fine, Copper, Enameled
E-Nam Corp.

WIRES, Gear Measuring
Van Keuren Co.

WIRES, Thread Measuring
Sheffield Gage
Van Keuren Co.

X-RAY CAMERAS, Diffraction
Baird Associates
Hayes Scientific App.

X-RAY EQUIPMENT
Baird Associates
Campbell Electric
Fish-Schurman Co.
Gen. Elec. X-Ray Corp.
Hayes Scientific App.
Industrial X-Ray Labs.
Jarrell-Ash Co.
Kelley-Koett Mfg. Co.
Patterson Screen Co.
Westinghouse X-Ray Co.
Wyland, George

X-RAY FLUOROSCOPIC SCREENS (See Screens, X-Ray Fluoroscopic)

X-RAY INTENSIFYING SCREENS (See Screens, X-Ray Intensifying)

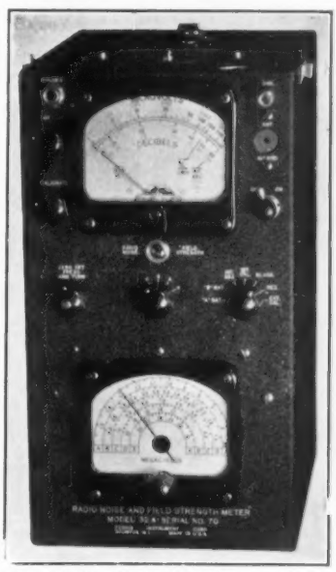
X-RAY SPECTOGRAPHS (See Spectographs, X-Ray)

X-RAY SPECTROMETERS (See Spectrometers, X-Ray)

X-RAY STEREOSCOPE (See Stereoscope, X-Ray)

X-RAY TUBES (See Tubes, X-Ray)

X-RAY VOLTMETER, High Potential
Shallcross Mfg. Co.



Ferris Model 32 Radio Noise and Field Strength Meter

A Universal Direct Reading Microvoltmeter for Measuring all Types of Radio Noise and Carrier Fields.

Coverage 150-350 and 550-20,000 kilocycles—direct reading logarithmic scale on output meter—built in calibrating generator. *Send for bulletin I-32 for complete details.*

Write for complete general catalogue on Ferris Signal Generators.

FERRIS INSTRUMENT CORP.
BOONTON, NEW JERSEY

For addresses, see pages 66-76

DESCRIPTIVE DIRECTORY

Of Manufacturers and Sole Representatives Selling Instruments and Devices
Used for Measurement, Inspection, Testing and Automatic Control

Advertisers are indicated by bold-face type

A

Abercrombie Pump Co., 2105 Gulf Bldg., Houston, Tex.
Mud pump pressure gages & shear-relief valves, check valves

Accurate Pyrometric Cone Co., Pataskala, Ohio
Seger cones

Accuracy Scientific Instrument Co., Huntingdon below Jasper St., Philadelphia, Pa.
Thermometers, hydrometers, thermo - hydrometers, thermoregulators

Ace Glass Inc., Vineland, N. J.
Chemical & laboratory glassware

Acme Regulator Co., Box 268, Tulsa, Okla.
High pressure regulators

Adde & Co., 57 Kennebec St., Portland, Maine
Counters

Advance Electric Co., 1260 W. Second St., Los Angeles, Calif.
Relays

Aerovox Corporation, New Bedford, Mass.
Condensers & resistors

Ainsworth & Sons, Inc., Wm., 2151 Lawrence St., Denver, Colo.
Scientific instruments; analytical, micro, assay & pulp balances & weights, pocket transits

Air Balance Instrument Co., 251 Natoma St., San Francisco, Calif.
Fluid meters

Ajax Engineering Co., 1260 Winslow St., N. W., Cleveland, Ohio
Balancing machines

Akatos, Inc., 55 Van Dam St., New York, N. Y.
Optical instruments

Allen-Bradley Co., 1326 S. Second St., Milwaukee, Wis.
Electric control apparatus

Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Conductivity meters, current & voltage regulators, KVA load regulators, hydraulic governors, instrument transformers

Aloe Co., A. S., 1819 Olive St., St. Louis, Mo.
Laboratory supplies

Alpha Instrument Co., 2103 K St., N. W., Washington, D. C.
Meteorological instruments

Alpha-Lux Co., Inc., 192 Front St., New York, N. Y.
Moisture testers

Altender & Sons, Theo., 1219 Spring Garden St., Philadelphia, Pa.
Drawing instruments

American Askania Corp., 826 Merchants & Manufacturers Bldg., Houston, Texas
Scientific instruments

American Automatic Electric Sales Co. See Automatic Electric Co.

American Blower Corp., 6000 Russell St., Detroit, Mich.
Manometers

American District Steam Co., North Tonawanda, N. Y.
Steam flowmeters

American Electrical Sales Co., Inc., 65-67 East 8th St., New York, N. Y.
Vacuum thermocouples

American Gage Co., 143 17th Ave., Paterson, N. J.
Plug & snap gages

American Gas Accumulator Co., 1029 Newark Ave., Elizabeth, N. J.
Time delay relays

American Gas Furnace Co., Lafayette, Spring & Elizabeth Sts., Elizabeth, N. J.
Furnace manufacturer, temperature controllers

American Indicator Paper Co., 4611 N. Kostner Ave., Chicago, Ill.
Chemical indicator papers

American Instrument Co., 8010-8020 Georgia Ave., Silver Spring, Md.
Scientific instruments & materials testing apparatus

American Machine & Metals, Inc.
See Riehle Testing Machine Div.

American M.A.N. Corporation, 40 Rector St., New York, N. Y.
Testing machines for tension, compression, torsion, bending, fatigue (torsional and bending), abrasion (wear). Mechanical oil testing machines. Bearing testing machines (friction, wear)

American Meter Co., 60 East 42nd St., New York, N. Y.
Tinned case & ironcase positive displacement gas & air meters, pressure reducing regulators, meter testing apparatus, indicating, recording & integrating flowmeters, rate volume & liquid level controllers & remote controllers

American Moistening Co., 260 W. Exchange St., Providence, R. I.
Psychrometers

American Paulin System, 1847 So. Flower St., Los Angeles, Calif.
Meteorological instruments

American Telescope Laboratories, Inc., 5864 Hollywood Blvd., Hollywood, Calif.
Astronomical instruments

American Temperature Indicating Co., 1017 Summit St., Toledo, Ohio
Electrical resistance thermometers

American Timer Corp., 316 Anderson Blvd., Geneva, Ill.
Portable timers

American Transformer Co., 178 Emmet St., Newark, N. J.
Transformers & electrical apparatus including voltage regulators, high voltage testing sets, rectifiers

Ames Co., B. C., Waltham, Mass.
Comparator & dial gages, length measuring devices

Amperite Corp., 561 Broadway, New York, N. Y.
Microphones

Amthor Testing Instrument Co., Inc., 4-10 Leo Place, Brooklyn, N. Y.
Physical testing machines

Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Balancing machines

Anderson Co., Gary, Indiana
Electrical remote indicators for liquid level, temperature, pressure & line voltage within automotive ranges

Andrew, Victor J., 6429 South Lavergne Ave., Chicago, Ill.
Radio antenna equipment

Annis Company, R. B., 1505-07-09 E. Michigan St., Indianapolis, Ind.
Permeameters

Ansonia Clock Co., Inc., 30 Rockefeller Plaza, New York, N. Y.
Timing devices

Applied Research Labs., 1208 San Julian St., Los Angeles, Calif.
Spectrochemical testing apparatus including spectrographs, projection comparators, densitometers, & power source units for arc & spark analysis.

Arca Regulators, Inc., 600 Forest St., Arlington, N. J.
Hydraulic & air operated controls

Arcturus Radio Tube Co., 720 Frelinghuysen Ave., Newark, N. J.
Vacuum tubes

Aristo Import Co., Inc., 630 Fifth Ave., New York
Stop watches

Arrow-Hart & Hegeman Electric Co., Hartford, Conn.
Magnetic, mercury & relay switches

Ashton Valve Company, 161 First St., Cambridge, Mass.
Pop, safety & relief valves, pressure gages, gage testers & master pilot & master pressure gages

Askania Regulator Co., 1603 So. Michigan Ave., Chicago, Ill.
Automatic control instruments

Associated Research, Inc., 431 S. Dearborn St., Chicago, Ill.
Vibrotest insulation testing equipment. Special measuring & testing instruments of electrical nature.

Atkins & Co., E. C., 402 So. Illinois St., Indianapolis, Ind.
Electrically operated valves for air, water, oil & steam

Atlas Electric Devices Co., 359 West Superior St., Chicago, Ill.
Fade-Ometer, Weather-Ometer, Launder-Ometer

Atlas Valve Co., 282 South St., Newark, N. J.
Regulator valves

Autocall Co., Shelby, Ohio
Electrical signaling, control & metering devices

Automatic Control Co., 1005 University Ave., St. Paul, Minn.
Circuit switches for automatic level controls, automatic timing & sequence controllers

Automatic Electric Co., 1033 W. Van Buren St., Chicago, Ill.
Telephone, signaling & communication apparatus.

Automatic Electric Mfg. Co., Mankato, Minn.
Time switches & interval timers

Automatic Products Co., 2450 North 32nd St., Milwaukee, Wis.
Solenoid valves

Automatic Scale Co., Inc., 591 Hudson St., New York, N. Y.
Automatic scales

Automatic Switch Co., 41 East 11th St., New York, N. Y.
Solenoid operated valves & automatic electric control apparatus

Automatic Temperature Control Co., Inc., 34 East Logan St., Philadelphia, Pa.
Timers, time control and specialty engineering. Valves & valve controllers, various types of relays.

Automatic Time Stamp Co., 139 Atlantic Ave., Boston, Mass.
Time stamps & job recorders

Automatic Valve Controller Co., Box 268, Tulsa, Okla.
Automatic valve control.

B

Bacharach Industrial Instrument Co., 7000 Bennett St., Pittsburgh, Pa.
Industrial instruments

Bacon, E. D., 4513 Brooklyn Ave., Cleveland, Ohio
Relays, switches & controls

Badger Meter Mfg. Co., 2371 North 30th St., Milwaukee, Wis.
Liquid meters

Bailey Meter Co., 1050 Ivanhoe Rd., Cleveland, Ohio
Metering & control equipment for power plants & industrial processes. Power plant instruments; boiler meter, meter combustion control operating directly from boiler meter, three-element feed water control, steam superheat control, desuperheating & pressure reducing control. Also metering & control equipment for sewage treatment, water supply & process industries

Baird Associates, 20 Palmer St., Cambridge, Mass.
Specialized physical & optical instruments including complete line of spectrographic & x-ray diffraction equipment

Baker Compass Co., Melrose, Mass.
Compasses

Baldwin-Southwark Corp., Paschall Post Office, Philadelphia, Pa.
Universal testing machines

Ballantine Labs., Inc., Boonton, N. J.
Artificial ears, electronic voltmeters, sound meters, vibration pickups, throat microphones, telephone receiver test equipment

Ballauf Mfg. Co., D., 621 H St., N. W., Washington, D. C.
Meteorological instruments

Barber-Coleman Co., Rockford, Ill.
Fractional horsepower motors

Barbour Stockwell Co., 205 Broadway, Cambridge, Mass.
Tachometers

Barkon-Frink Tube Lighting Co., 23-10 Bridge Plaza South, Long Island City, N. Y.
Daylight lighting

Barnstead Still & Sterilizer Co., Inc., 2 Lanesville Terrace, Boston, Mass.
Water stills

Bastian-Blessing Co., 240 E. Ontario St., Chicago, Ill.
Regulating valves

Bausch & Lomb Optical Co., 635 St. Paul St., Rochester, N. Y.
Optical instruments for industrial, scientific & educational use including microscopes, colorimeters, refractometers, photomicrographic & metallographic equipment, contour measuring projector, optical glass & special optical systems

Bear Mfg. Co., Rock Island, Ill.
Balancing machines

Beck Bros., 421 Sedgley Ave., Philadelphia, Pa.
Resistors

Beck Co., Harold C., 223 West Mt. Airy Ave., Philadelphia, Pa.
Pyrometer controllers

Becker, Inc., Christian, 92 Reade St., New York, N. Y.
Precision balances & weights, including analytical, assay, magnetically damped, diamond, specific gravity, dairy, druggists, textile.

Becker, Joseph, 630 W. 168th St., New York, N. Y.

Beckmann Co., L., 1008 Jackson, Toledo, Ohio
Surveying instruments

Belfield Co., H., Broad & Hamilton Sts., Philadelphia, Pa.
Valves

Bell & Howell Co., 1801-15 Larchmont Ave., Chicago, Ill.
Motion picture equipment including cameras, projectors & accessories

Bendix Aviation Corp., Marine Division, 754 Lexington Ave., Brooklyn, N. Y.
Marine Instruments of all types, annunciators, Autosyn motor ship, telegraphs, marine fittings, marine telephone equipment, general industrial safety & signaling equipment

Benwood Linze Co., 1832 Washington Ave., St. Louis, Mo.
Rectifier power units

Berg Mfg. Co., James, 3707-12th Ave., Brooklyn, N. Y.
Hydrometers & thermometers

Berge, J. & H., 145 Hudson St., New York, N. Y.
Laboratory supplies

Berger & Sons, Inc., C. L., 37 Williams St., Roxbury, Boston, Mass.
Surveying instruments

Best Scientific Class App. Wks., 2039 Fremont St., Chicago, Ill.

Betts and Betts, 551 West 52nd St., New York, N. Y.
Multiple circuit timers, controls, time delay relays & motor driven & thermostatic interrupters

CAMBRIDGE INSTRUMENTS

for exacting professions and industries

VIBROGRAPHS, FLUXMETERS, GEOPHYSICAL SEISMOGRAPHS, AERO MIXTURE INDICATORS, EXHAUST GAS TESTERS, ELECTROMETERS, GALVANOMETERS, ELECTROCARDIOGRAPHS, and many other mechanical and electrical instruments of precision for use in science, medicine and industry.

Pioneer Manufacturers of Precision Instruments

CAMBRIDGE INSTRUMENT CO., INC.

3732 GRAND CENTRAL TERMINAL
NEW YORK CITY

Giddle Co., James G., 1211 Arch St., Philadelphia, Pa.
Insulation testers, ground testers & ohmmeters, speed-measuring instruments, frequency meters, sliding-contact rheostats

Ginckley, George Sydney, 857 S. San Pedro St., Los Angeles, Calif.
Instruments for measurement of specific gravities & viscosities of fluids.

Bin-Dicator Co., 14615 East Jefferson Ave., Detroit, Mich.
Automatic bin level indication & control

Biological Supply Co., 1176 Mount Hope Ave., Rochester, N. Y.
Biological supplies

Black & Decker Mfg. Co., 715 Pennsylvania Ave., Towson, Md.
Truck scales

Bliley Electric Co., 200 Union Station Bldg., Erie, Pa.
Quartz piezo-electric crystals

Bliss & Co., Inc., John, 84 Pearl St., New York, N. Y.
Marine instruments

Blossom Mfg. Co., 79 Madison Co., New York, N. Y.
Instrument covers of transparent fabrics

Bock Machine Co., 3618 Colerain Ave., Cincinnati, Ohio
Erichsen sheet metal testing machine

Bodine Electric Co., 2254 W. Ohio St., Chicago, Ill.
Motors, all types of windings from 1/2000 to 1/6 hp, speed reducer & nonreducer motors

Boekel & Co., Wm., 509-519 Vine St., Philadelphia, Pa.
Laboratory apparatus

Boiler Room Equipment, Inc., 45 West 45th St., New York, N. Y.
Smoke alarms

Boonton Radio Corp., Boonton, N. J.
Radio test instruments

Borden Electric Co., Summit, N. J.
Ground resistance meters

Boston Auto Gage Co., 70 West St., Pittsfield, Mass.
Liquid level gages and allied lines

Bostrom-Brady Mfg. Co., Stonewall & Bailey Sts., Atlanta, Ga.
Surveying instruments

Boulin Instrument Corp., 65 Madison Ave., New York, N. Y.
Chronometric hand tachometers, wound stroboscopes, electrical stroboscope, speed indicators & portable & stationary tachometers

Bowser & Co., Inc., S. F., 1302 E. Creighton Ave., Fort Wayne, Ind.
Liquid meters

Boylston Steam Specialty Co., 116 W. Illinois St., Chicago, Ill.
Regulating valves

Brabender Corp., Rochelle Park, N. J.
Industrial measuring & control apparatus for plastic & viscous materials; semi-automatic moisture testers

Bradley Laboratories, Inc., 82 Meadow St., New Haven, Conn.
Photoelectric cells

Braun Corp., 2260 East 15th St., Los Angeles, Calif.
Chemicals & laboratory supplies

Braun-Knecht-Heimann Co., 576 Mission St., San Francisco, Calif.
Laboratory supplies

Bristol Company, Waterbury, Conn.
Recording & automatic controlling instruments for pressure, vacuum, draft, absolute pressure, humidity, liquid level, flow, pH value, temperature (pyrometers & thermometers) & speed. Included are recording barometers, voltmeters, ammeters, wattmeters, dairy instruments, machine operation, motion & operation recorders, control valves, telemetering instruments, process cycle controllers, coordinated process control, time-temperature & time-pressure controllers, potentiometers, air operated & electric controllers & thermal converters. Variations & combinations of these instruments are offered for applications in the various industries & processes

Brodie Co., Inc., Ralph N., 61st & Lowell Sts., Oakland, Calif.
Positive displacement petroleum meters & accessories

Brooke Engineering Co., Inc., 4517 Wayne Ave., Philadelphia, Pa.
Electrically actuated pressure & flow controllers

Brookfield Engineering Laboratories, Sharon, Mass.
Synchro-lectric viscosimeter

Brooklyn Thermometer Co., Meriden, Conn.
Thermometers & hydrometers

Brown Gravity Meter Corp., P. O. Box 6005, Houston, Tex.
Instruments for measuring earth's gravitational field

Brown Instrument Company, 4482 Wayne Ave., Philadelphia, Pa.
Thermocouple & optical pyrometers, resistance thermometers, pressure thermometers, pressure gages, flow meters, liquid level gages, hygrometers, CO_2 meters, control systems; electric, air-operated & combined electric & air-operated; combustion safety controls, moisture content recorder & controller & furnace atmosphere recorder

Brown & Sharpe Mfg. Co., Providence, R. I.
Machine shop instruments

Brush Development Co., 3331 Perkins Ave., Cleveland, Ohio
Piezoelectric instruments including laboratory microphones, vibration & fluid pulsation pickups, galvanometers, pen oscillographs, surface finish testers, artificial ears, headphones, phonograph pickups & cutters

Bryden Co., 96 Church St., Waltham, Mass.
Scientific instruments

Buehler, Adolph I., 228 N. La Salle St. & Wacker Dr., Chicago, Ill.
Metallographic laboratory apparatus

Buffalo Apparatus Corp., 180 Main St., Buffalo, N. Y.
Laboratory supplies

Buffalo Meter Co., 2917 Main St., Buffalo, N. Y.
Liquid meters for measurement of cold water, hot water, oils, chemicals. Integrating registers, cumulative, setback, or predetermined control.

Buffalo Scale Co., 1200 Niagara St., Buffalo, N. Y.
Scales

Builders Iron Foundry, 9 Codding St., Providence, R. I.
High pressure flow, level, weight, pressure & temperature, metering & control instruments

Bullard Co., E. D., 275 Eighth St., San Francisco, Calif.
Gas leak detectors

Bunnell & Company, J. H., 215 Fulton St., New York, N. Y.
Relays & switches

Burgess Battery Co., Freeport, Ill.
Dry batteries

Burke, Louis, 41 John St., New York, N. Y.
Stop watches and chronometers

Burling Instrument Co., 251-253 Springfield Ave., Newark, N. J.
Temperature controls for laboratories, Industrial processes, furnaces & ovens. (-100° to 1400°F.) Standard tubes or special alloys & ranges.

Burlington Instrument Corp., Burlington, Iowa
Electrical control apparatus

Burrell Technical Supply Co., 1942 Fifth Ave., Pittsburgh, Pa.
Scientific instruments & laboratory supplies

Burt Scientific Labs., R. C., 1212 E. Green St., Pasadena, Calif.
Special instruments

Burton-Rogers Co., 857 Boylston St., Boston, Mass.
Electrical instruments

Bushnell and Nevius, 913 N. LaCienega Blvd., Los Angeles, Calif.
Control apparatus

C

Calculagraph Co., Harrison, N. J.
Elapsed time indicator

Calibron Products, Inc., 51 Lakeside Ave., West Orange, N. J.
Special apparatus

Calkins Co., 934 S. Main St., Los Angeles, Calif.

Callahan & Co., E. J., 14 W. Barre St., Baltimore, Md.

Calta Glass Wks., 2158 Ogden Ave., Chicago, Ill.

Cambosco Scientific Co., Waverley, Mass.

Cambridge Instrument Co., Inc., Grand Central Terminal, New York, N. Y.
Scientific & industrial instruments

Cameron Surgical Specialty Co., 666 W. Division St., Chicago, Ill.

Campbell Electric Co., Lynn, Mass.
Transformers, high frequency & X-ray equipment

Campion Labs., Don C., 9088 Alpine Ave., Detroit, Mich.
Liquid meters for small flows

Cardwell Mfg. Corp., Allen D., 81 Prospect St., Brooklyn, N. Y.
Variable & fixed air condensers

Cargille, R. P., 118 Liberty St., New York, N. Y.
Chemical laboratory & photographic devices

Cash Company, A. W., Decatur, Ill.
Combustion control instruments.

Central Scientific Co., 1700 Irving Park Blvd., Chicago, Ill.
Scientific instruments & laboratory apparatus

Central Station Steam Co., 2910 E. Woodbridge St., Detroit, Mich.
Rotary type condensate meter

Certified Gauge & Inst. Co., 34-18 Northern Blvd., Long Island City, N. Y.
Pressure gages

Chace Co., W. M., 1600 Beard Ave., Detroit, Mich.
Thermostatic bimetals

Chaslyn Co., 4527 Ravenswood Ave., Chicago, Ill.
Storage battery testers

Chatillon & Sons, John, 85 Cliff St., New York, N. Y.
Iso-elastic springs

Chelsea Clock Company, 284 Everett Ave., Chelsea, Mass.
Clocks & clock movements

Chemical Rubber Co., 1933 West 114th St., Cleveland, Ohio
Laboratory supplies

Chicago Apparatus Co., 1735 No. Ashland Ave., Chicago, Ill.
Laboratory supplies

Chicago Dial Indicator Co., 544 W. Washington, Chicago, Ill.
Machinist's dial indicators

Chicago Surgical & Electrical Co., 324 W. Superior St., Chicago, Ill.

Cincinnati Clock & Instrument Co., 1113 York St., Cincinnati, Ohio
Circuit breaker analyzer

Cincinnati Scientific Co., 224 Main St., Cincinnati, Ohio
Laboratory supplies

Cincinnati Time Recorder Co., 1733 Central Ave., Cincinnati, Ohio
Time recorders

Claflin Co., Geo. L., 150 Dorrance St., Providence, R. I.

Clapp Inst. Co., Webster, Mass.
Aircraft instruments, thermometers & pressure & vacuum gages

Clare & Co., C. P., Lawrence & Lamon Ave., Chicago, Ill.
Relays, electric counters & electro mechanical specialties

Clark Blast Meter Co., Chas. J., Gladbrook, Iowa
Foundry blast meters & pressure gages

Clark & Sons Co., Alvan, 58 Day St., West Somerville, Mass.
Optical & astronomical instruments

Clarostat Mfg. Co., Inc., 285 North Sixth St., Brooklyn, N. Y.
Resistors

Clay-Adams Co., Inc., 25 E. 26th St., New York, N. Y.
Angle & micro centrifuges, compact balances, analytical weights, microscope slides & cover glasses, glass & porcelain ink, tuning forks

Clebar Watch Co., 551 Fifth Ave., New York, N. Y.
Stop watches, timers & chronographs

Cleveland Gas Meter Co., 2180 East 65th St., Cleveland, Ohio
Tin case gas meters

Clifford Mfg. Co., 584 E. First St., Boston, Mass.
Metallic bellows & diaphragms; thermostatic assemblies; packless valves

Clough-Brengle Co., 5501 Broadway, Chicago, Ill.
Electrical instruments, communication testing instruments

Coats Machine Tool Co., Inc., 110 West 40th St., New York, N. Y.
Spring testers

Cochrane Corp., 17th St., Allegheny Avenue, Philadelphia, Pa.
Flowmeters, electrical & mechanical; liquid level meters & controllers; weir meters; pressure & temperature recorders; blow off & relief valves

Cole Co., H., 24 North High St., Columbus, Ohio
Surveying instruments

Coleman Electric Co., Inc., 310 Madison St., Maywood, Ill.
Electrical measuring instruments for technical applications

Colloid Equipment Co., Inc. 50 Church St., New York, N. Y.
Laboratory apparatus

Columbia Electric Mfg. Co., 4519 Hamilton Ave., Cleveland, Ohio
Rheostats, instruments, shunts, switchboards & special electrical equipment

Commerce Pattern Foundry & Machine Co., 2211 Grand River Ave., Detroit, Mich.
Balancing machines

Commercial Engineering Labs., 4612 Woodward Ave., Detroit, Mich.
Laboratory instruments for automotive, aircraft, railway & allied industries: air flow indicators, direct pressure & piezo-ray engine indicators, fuel flow indicators, magnetic gages, torsional vibration indicators (piezo-ray), recorders (torsiographs) & recording instruments for car performance & riding comfort

Commercial Iron Works, 2426 Porter St., Los Angeles, Calif.
Orifice fittings

Comtor Company, 87 Rumford Ave., Waltham, Mass.
Precision internal & external comparator-type diameter gages

Conant, George H., 719 Watson St., Ripon, Wis.

Connelly Iron Sponge & Governor Co., 3154 So. California Ave., Chicago, Ill.
Gages & manometers, B T U indicator & H_2S tester

Consolidated Ashcroft Hancock Co., American Schaeffer & Budenberg Div., Bridgeport, Conn.
Industrial instruments

Consulting & Engineering Co., Carson St. & Terminal Way, Pittsburgh, Pa.
Combustion controllers

Continental Electric Co., Geneva, Ill.
Photoelectric tubes & equipment

Controls, Inc., Towaco, N. J.
Control valves; motor driven time delay relays; process timing devices

Cook Electric Co., 2700 Southport Ave., Chicago, Ill.
Electrical control devices, metal bellows, vapor motors & telephone protective & distributing apparatus

Coors Porcelain Co., Golden, Colo.
Chemical & scientific porcelain

Corbin Screw Corp., New Britain, Conn.
Tachometers & speedometers

Cornell-Dubilier Electric Corp., So. Plainfield, New Jersey
Mica, dykanol, paper & wet & dry electrolytic capacitors

Corning Glass Works, Corning, N. Y.
Technical glassware

Coxhead Corp., Ralph C., 17 Park Place, New York, N. Y.
Composing typewriter with changeable faces and spaces used for preparing catalogues, bulletins, folders, forms, etc. for stencil or offset production.

Cramer Co., Inc., R. W., Centerbrook, Conn.
Interval timers, running time meters, time switches, signal control switches

Crosby Steam Gage & Valve Co., 30 Church St., New York, N. Y.
Safety & relief valves, gages, recorders, testers & steam engine indicators

Crowley & Co., Henry L., 1 Central Ave., West Orange, N. J.
Capacitors

Curtin & Co., W. H., 2019 Franklin Ave., Houston, Tex.
Laboratory supplies

Cutler-Hammer, Inc., 315 North 12th St., Milwaukee, Wis.
Electric motor control, safety switches, motor driven valve operators, gas calorimeters, gas mixing & stabilizing control, resistors

D

Daigger & Co., A., 159 W. Kinzie St., Chicago, Ill.
Laboratory supplies

Daniel Orifice Fitting Co., 3350 U. P. Ave., Los Angeles, Calif.
Orifice fittings

Daven Co., 158 Summit St., Newark, N. J.
Attenuators, calibrating equipment for electrical instruments & resistors

Davis Emergency Equipment Co., Inc., 57 Van Dam Street, New York, N. Y.
Inflammable gas alarms

Davis Regulator Co., 2541 So. Washtenaw Ave., Pilsen Sta., Chicago, Ill.
Valves

Dearborn Gage Co., 22038 Beech St., Dearborn, Mich.
Chromium plated gage blocks

Defender Automatic Regulator Co., 308 S. 8th St., St. Louis, Mo.
Industrial instruments

De Jur-Amsco Corp., Shelton, Conn.
Photoelectric exposure meters, electrical, radio & photographic products

Delmhorst, Wm. J., 90 West St., New York, N. Y.
Moisture detectors

Deming Indicator Co., 108 Fountain Ave., Dayton, Ohio
Test indicators

Demuth Glass Works, Inc., Wythe Ave. at N. 11th St., Brooklyn, N. Y.

Denominator Co., Inc., 261 Broadway, New York
Group counting machines

Denver Fire Clay Co., 2301 Blake St., Denver, Colo.
Specialized industrial control equipment for power plant & processing industries, laboratory specialties

D'Este Co., Julien, 6 Spice St., Charlestown, Mass.
Control valves

Detroit Air Meter Co., P. O. Box 1473, Detroit, Mich.
Air flowmeters

Detroit Lubricator Co., 5900 Trumbull Ave., Detroit, Mich.
Automatic controls & equipment for air conditioning

Detroit Testing Machine Co., Grinnell Ave., Detroit, Mich.
Testing machines

Deutschmann Corp., Tobe, Canton, Mass.
Equipment for locating, eliminating, and measuring radio noise; electrolytic, paper dielectric & oil type capacitors

Dickson Co., 7420 Woodlawn Ave., Chicago, Ill.
Furnace controls

Dietert Co., Harry W., 9330 Roselawn Ave., Detroit, Mich.
Sand testing equipment; immersion pyrometers, moisture testers, accessories for spectrographic laboratories

Dietzen Co., Eugene, 2425 Sheffield Ave., Chicago
Drafting & surveying instruments

Dillon & Co., Inc., W. C., 5410 W. Harrison St., Chicago, Ill.
Traction dynamometers, tensile machines, thermometers

Distillation Products, Inc., 755 Ridge Road West, Rochester, N. Y.
High vacuum pumps, low vapor pressure fluids & auxiliary equipment

Dockson Co., C. H., 3839 Wabash Ave., Detroit, Mich.
Regulating valves

Doerr Glass Co., Inc., 500 Peach St., Vineland, N. J.

Dongan Electric Mfg. Co., 2987 Franklin St., Detroit, Mich.
Transformers

Dorr-Patterson Engineering Co., 3362 Wight St., Detroit, Mich.
Physical testing machines

Drafto Co., Cochranton, Pa.
Drafting machines

Driftmeter, Inc., 616 Exchange Bank Bldg., Tulsa, Okla.
Oil well instruments

Dubrovin, John, 2946 N. Kenneth Ave., Chicago, Ill.
Mercurial vacuum gage, absolute type

Ducommun Co., M., 580 Fifth Ave., New York, N. Y.
Coil-spring stopwatches

Du Mont Labs., Inc., Allen B., 2 Main Ave., Passaic, N. J.
Cathode-ray oscillographs, cathode-ray tubes, associated electronic equipment, television control, studio & transmitting equipment

Duncan Electric Mfg. Co., Lafayette, Ind.
A-c. & d-c. watthour meters, service & switchboard types; portable test meters, appliance meters & instrument transformers

Dunn, Inc., Struthers, 1310 Cherry St., Philadelphia, Pa.
Relays, timing devices, electric counters, thermostats

Durant Manufacturing Co., 1930 N. Buffum St., Milwaukee, Wisc.
Counting & measuring machines

Dwyer Mfg. Co., F. W., 565 W. Washington Blvd., Chicago, Ill.
Portable & stationary draft gages, CO_2 indicators & combustion testing sets

E

Eagle Signal Corp., 202 20th St., Moline, Ill.
Industrial control devices, traffic signal controllers & sign flashers

Eastern Engineering Co., 45 Fox St., New Haven, Conn.
Laboratory pumps, stirrers & thermoregulators

Eastern Science Supply Co., 7-9 High St., Brookline, Mass.
Meteorological instruments

Eastern Scientific Co., 51 Bassett St., Providence, R. I.

Eastern Specialty Co., 3617 N. 8th St., Philadelphia, Pa.
Testing equipment for checking & maintenance of all types of electricity meters such as watthour meters, demand instruments, etc. Special apparatus for load survey work.

Eberbach & Sons, Ann Arbor, Mich.
Laboratory furniture

Eby, Inc., Hugh H., 4700 Stenton Ave., Philadelphia, Pa.
Relays & radio parts

Eclipse Aviation, Div. of Bendix Aviation Corp., Bendix, N. J.
Aircraft electrical & mechanical accessories

Economy Electric Devices Co., 37 West Van Buren St., Chicago, Ill.
Electric meters, watthour & amperehour, for street and electric railways and trolley busses

Edelmann & Co., E., 2332 Logan Blvd., Chicago, Ill.
Automotive test instruments

Edison, Inc., Thomas A., Edison Electrical Controls division, West Orange, N. J.
Sealed-in-glass control devices, including thermostatic switches, fire detection thermostats, & timing relays. Hermetically sealed thermostatic valves. Special control equipment

Eimer & Amend, 205-223 Third Ave., New York, N. Y.
Biological & chemical laboratory apparatus & supplies

Eitzen Co., Louis C., 204 W. 59th St., New York, N. Y.
Extensometers

Electric Controller & Mfg. Co., 2700 East 79th St., Cleveland, Ohio
Electrical controllers

Electric Heat Control Apparatus Co., 175 Fifth Ave., New York, N. Y.
Laboratory ovens

Electric Indicator Corp., 21 Parker Ave., Stamford, Conn.
Synchronous motors, position indicators, level controls, signalling devices

Electric Sorting Machine Co., Michigan Trust Bldg., Grand Rapids, Mich.
Color analysers

Electric Speed Indicator Co., 14618 Bayes Ave., Lakewood, Ohio
Precision electric tachometers & remote position indicators

Electric Switch Corp., 1409 Union St., Columbus, Ind.
Mercury switches

Electric Tachometer Corp., 1358 Spring Garden St., Philadelphia, Pa.
Speed indicators & recorders, electric & mechanical counters

Electric Valve Mfg. Co., 64 Murray, New York, N. Y.
Electrically operated valves

Electrical Coil Winding Co., 2736 Saunders St., Camden, N. J.
Magnet & solenoid coils

Electrical Facilities Inc., 4224 Holden St., Oakland, Calif.
Apparatus for electrical measuring & testing, including precision transformers, watthour meter and instrument transformer testing equipment; rectifier apparatus

Electrical Research Products Inc., 195 Broadway, New York, N. Y.
Instruments are offered for acoustic, noise or vibration control problems, in the product development laboratory, for field testing and for routine production testing applications

Electrical Testing Labs., 80th St. & East End Ave., New York, N. Y.
Electrical testing & inspection

Electrimatic Corp., 2100 Indiana Ave., Chicago, Ill.
Automatic control valves & controls, regulating valves, Pressure, temperature & electrical actuation

Electro-Medical Laboratory, Inc., Holliston, Mass.
Neurological & allied medical instruments & general electronic apparatus

Electro Products Laboratories, 549 West Randolph St., Chicago, Ill.
Battery eliminators & rectified A.C. devices

Electrocon Corp., 6 Varick St., New York, N. Y.
Vibration measuring instruments & equipment for dynamic balancing of rotating machines

Electronic Laboratory, 306 S. Edinburgh Ave., Los Angeles, Calif.
Photo-electric instruments; also photoconductive cells.

Electronic Products Co., St. Charles, Ill.
Electronic devices

Electronic Research Laboratory, Niles Center, Illinois
Color analysis apparatus

Electrons, Inc. of Delaware, 127 Sussex Ave., Newark, N. J.
Gas-filled & grid-control rectifier tubes

Elematic Mfg. Co., 7542 S. Chicago Ave., Chicago, Ill.
Pyrometers

Elgin National Watch Co., Elgin, Ill.
Watches, clocks, aircraft instruments

Ellison Draft Gage Co., 214 West Kenzie St., Chicago, Ill.
Manometers, draft gages, orsats

Elsbert Mfg. Co., Inc., 910 W. Lake St., Chicago, Ill.
Remote control fractional horsepower motors

Emerson Apparatus Co., 171 Tremont St., Melrose, Mass.
Calorimeters

Emery Co., A. H., 682 Main St., Stamford, Conn.
Bourdon gages

Empire Laboratory Supply Co., 549 W. 32nd St., New York, N. Y.
Laboratory supplies

E-Nam Corporation, 45 E. 17 St., New York, N. Y.
Fine enameled copper wire

Engel, Inc., H. C. M., P. O. Box 233, Sidney, N. Y.
Small drills, small turned parts, millstones in sapphire and block grinding discs

Engelhard, Inc., Charles, 233 New Jersey R. R. Ave., Newark, N. J.
Industrial instruments

Engineering Laboratories, Inc., 705 Kennedy Bldg., Tulsa, Okla.
Seismic exploration equipment, vibration detectors, petroleum engineering devices, signalling equipment

Eppley Laboratory Inc., 12 Sheffield Ave., Newport R. I.
Thermopiles, pyrheliometers & standard cells for both industrial & laboratory use

...al Co., 1825-39 Wylie St., Philadelphia, Pa.
...ric motor overload protectors
... Co., O. E., 1274 Augusta Blvd., Chicago, Ill.
Instrument Co., 31 Irving Place, New York, N. Y.
...bustion indicators & recorders, visual & electric ... smoke indicators, flame failure alarms, sensi... relays & special electric eye indicators
...line-Angus Co., Inc., P. O. Box 596, Indianapolis, Ind.
...graphic recording & contact-making electrical instruments, time, speed, condensate purity, pressure & vacuum recorders, telemeters & portable current transformers
...erson Mfg. Co., 214 W. Huron St., Chicago, Ill.
Chemical feeders
...Weight Scale Co., 944 West 5th Ave., Columbus, Ohio
Over-and-under weight scales & indicators for industrial purposes

F

Fairchney Instrument Corp., Watertown, N. Y.
Laboratory thermometers
Fairbanks, Morse & Co., 600 So. Michigan Ave., Chicago, Ill.
Scales
Falstrom Co., Main Ave. & D. L. & W. R. R., Passaic, N. J.
Steel instrument panels, panel board assemblies, cubicles, totally enclosed weather & vermin proof instrument enclosures & steel cabinets
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Large micrometers
Fassett Co., Inc., C. M., 209 North Wall St., Spokane, Wash.
Laboratory supplies
Fecker, J. W., 2016 Perrysville Ave., N. S., Pittsburgh, Pa.
Astronomical instruments
Federal Pneumatic Systems, Inc., 127 N. Dearborn St., Chicago, Ill.
Particle size classifiers
Federal Products Corp., 1144 Eddy St., Providence, R. I.
Precision measuring instruments
Fee and Stemwedel, Inc., 4949 North Pulaski Rd., Chicago, Ill.
Dial type thermometers, barometers, humidity indicators & allied products, field glasses & binoculars
Fenwal, Inc., 3 Main St., Ashland, Mass.
Industrial thermostats
Ferner Co., R. Y., 131 State St., Boston, Mass.
Precision instruments
Ferranti Electric, Inc., 30 Rockefeller Plaza, New York, N. Y.
Electrical instruments
Ferris Instrument Corp., Boonton, N. J.
Laboratory & production testing equipment, radio noise & field strength meters & special electrical instruments
Fidelity Machine Co., 3906 Frankfort Ave., Philadelphia, Pa.
Abrasion testers
Field Electrical Instrument Co., 2258 Morris Ave., New York, N. Y.
Vacuum thermocouples
Fink-Roselieve Co., Inc., 109 W. 64th St., New York, N. Y.
Thermometers
Fischer & Porter Co., 59 W. Queen Lane, Germantown, Philadelphia, Pa.
Rotameters, sight flow meters, precision glass tubes of any shape including square, oval, cylindrical, tapered.
Fish-Schurman Corp., 250 East 43rd St., New York, N. Y.
Scientific instruments, optical, technical & scientific glassware & porcelain
Fisher Governor Co., Marshalltown, Iowa
Motor control valves & regulators
Fisher Scientific Co., 711 Forbes St., Pittsburgh, Pa.
Standard & special equipment & instruments for chemical, biological & metallurgical laboratories
Fleischhauer & Son, Frank, 89-36 187 Place, Hollis, L. I., N. Y.
Thermometers & hydrometers
Fluid Meters, Inc., 44 Wall St., Room 1101, New York, N. Y.
Positive displacement meters, 1/10 to 8 gallons per hour with gravity pressures
Ford Meter Box Co., Wabash, Indiana
Water meter testers
Ford Motor Company, 3674 Schaefer Rd., Dearborn, Mich.
Johansson gage blocks & accessories such as parallels, adjustable holders, scribers, straight edges, center points, sine bars
Ford Regulator Valve Co., 403 Broome St., New York, N. Y.
Regulating valves
Foster Engineering Co., 109 Monroe St., Newark, N. J.
Control valves
Foxboro Co., 46 Neponset Ave., Foxboro, Mass.
Indicating, recording & controlling instruments for pressure, temperature, humidity, level & flow
Fredericks Co., George E., Bethayres, Pa.
Glass instruments & apparatus
Frick Co., Inc., Waynesboro, Pa.
Float valve controls & electric controls, refrigerating & air conditioning machinery
Fried & Lustig, Inc., 31 Union Square, New York, N. Y.
Thermometers
Friez & Sons, Division, Julien P., Bendix Aviation Corp., Baltimore St. & Central Ave., Baltimore, Md.
Temperature & humidity controls, gas & stoker controls, damper motors, electrical relays, temperature & humidity indicators & recorders, psychrometers, draft gages, anemometers, CO_2 analyzers
Frober-Faybor Co., P. O. Box 232, Chagrin Falls, Ohio
Photoelectric colorimeters
Fuess, Inc., R., 39 West 60th St., New York, N. Y.
Scientific instruments
Fulton Sylphon Co., Knoxville, Tenn.
Temperature & pressure regulators, sylphon bellows; thermostat assemblies; diesel controls; automobile thermostats; air conditioning controls
Furnas Electric Co., 811 South 72nd St., West Allis, Wis.
Pressure controls

G

Gaertner Scientific Corp., 1201 Wrightwood Ave., Chicago, Ill.
Physical & scientific instruments
Gas Appliance Specialties Co., 57th St., bet. Northern Blvd. & 32nd Ave., Woodside, New York, N. Y.
Gas regulators
Gauthier, Donat A., 7408 Poe Ave., Detroit, Mich.
Gasoline measuring devices & automobile service station testers
Geier & Bluhm Inc., 607 River St., Troy, N. Y.
Mechanical devices & spirit level vials
Genales, Andrew, 29 Second Ave., Nyack, N. Y.
Toolroom test indicators
General Biological Supply House, Inc., 761 East 69th Pl., Chicago, Ill.
Biological laboratory supplies
General Combustion Corp., 2218 W. Lake St., Chicago, Ill.
Combustion equipment
General Controls Co., 1370 Harrison, San Francisco, Calif.
Control valves
General Electric Co., 1 River Rd., Schenectady, N. Y.
Electrical instruments & meters
General Electric Co., Lamp Dept., Nela Park, Cleveland, Ohio
Lighting sources
General Electric X-Ray Corp., 2012 Jackson Blvd., Chicago, Ill.
Medical, dental & industrial X-ray apparatus, accessories & suppliers
General Engg. & Model Works, 421 N. Braddock Ave., Pittsburgh, Pa.
Gages & precision measuring instruments for checking threaded tubular products
General Physical Laboratory, 509 Fifth Ave., New York, N. Y.
Electronic apparatus
General Radio Co., 30 State St., Cambridge, Mass.
Radio & electrical measuring instruments for laboratory & industrial use; stroboscopes, noise measuring equipment, measuring & test equipment for electrical communication systems
General Regulator Corp., 165 Broadway, New York, N. Y.
Combustion, draft, liquid level & pressure controls
General Sales & Products Corp., 45 Mohawk St., Cohoes, N. Y.
Shut-off valves
General Scientific Corp., 4829 So. Kedzie Ave., Chicago, Ill.
Lenses & photoelectric cells
General Television Corp., 70 Brookline Ave., Boston, Mass.
Ionization vacuum gages
Geophysical Instrument Co., 1315 Half St., S. E., Washington, D. C.
Instruments & accessories for prospecting for oil, minerals, water, bedrock; also equipment for making measurements in wells
Gilmore, E. R., Box 5718, Homewood Sta., Pittsburgh, Pa.
Gas leak stethoscopes
Gilmore Drug Co., W. J., 422 Blvd. of Allies, Pittsburgh, Pa.
Laboratory supplies
Gisholt Machine Co., Madison, Wis.
Static & dynamic balancing machines
Glass Engraving Co., 3604-3606 Park Ave., New York, N. Y.
Glass engraving
Gleason-Avery, Inc., 27 Clark, Auburn, N. Y.
Furnace controls
Globe Phone Mfg. Corp., Reading, Mass.
Pipe locating equipment, leaky valve locators, hearing aids, secret phone or listening equipment for government investigating agencies
Globe Tool & Engg. Co., 410 Davis Ave., Dayton, Ohio
Dynamic balancing equipment
Glogau & Co., 1632 Rand McNally Bldg., Chicago, Ill.
Calipers
G-M Laboratories, Inc., 1731 Belmont Ave., Chicago, Ill.
Photoelectric cells, photoelectric relays, slide wire rheostats, galvanometers, laboratory stands & clamps
G. M. Manufacturing Co., 180 Centre St., New York, N. Y.
Thermometers, hydrometers, psychrometers, hygrometers
Goerz American Optical Co., C. P., 317 East 34th St., New York, N. Y.
Photographic lenses & accessories
Goetze Niemer Co., 808 Francis St., St. Joseph, Mo.
Goldak Co., 1031 S. Broadway, Los Angeles, Calif.
Surveying Instruments.
Goodrich Co., B. F., 450 South Main St., Akron, Ohio
Vibration absorbers
Gordon Co., Claud S., 1524 S. Western Ave., Chicago, Ill.
High temperature equipment accessories, such as thermocouples, thermocouple wire, lead wire, insulators
Gorrell & Gorrell, Chicago Heights, Ill.
Equipment for biological & psychological work
Gotham Instrument Co., 127 Spring St., New York, N. Y.
Indicating, dial & recording thermometers
Gotham Scientific Co., 106 Water St., New York, N. Y.
Laboratory supplies
Gow-Mac Instrument Co., 22 Lawrence St., Newark, N. J.
Thermal conductivity gas analyzers & gas analysis cells
Gray Instrument Co., 64½ W. Johnson St., Philadelphia, Pa.
Scientific instruments
Green, Arthur B., 284 Harris Ave., Needham, Mass.
Paper plant test instruments
Green, Henry J., 1191 Bedford Ave., Brooklyn, N. Y.
Meteorological instruments
Greene Bros., Inc., 1810 Griffin St., Dallas, Texas
Laboratory Supplies
Greenfield Tap & Die Corp., Greenfield, Mass.
Machine shop gages
Greiner, Inc., Emil, 55 Vandam St., New York, N. Y.
Laboratory Supplies
Griebel Instrument Co., Inc., 42 River St., Carbondale, Pa.
Thermometers, hydrometers, chemical & laboratory glassware
Griner Co., A. J., 417 East 13th St., Kansas City, Mo.
Laboratory supplies
Grove Regulator Co., 1720 Poplar St., Oakland, Calif.
Pump governors, pressure reducing & back pressure regulators for gas or liquid pressures to 6000 lbs.
Guardian Electric Mfg. Co., 1621 W. Walnut St., Chicago, Ill.
A-c. and d-c. relays
Gump Co., B. F., 435 S. Clinton St., Chicago, Ill.
Scales
Gurley, W. & L. E., 514 Fulton St., Troy, N. Y.
Surveying & allied engineering instruments, paper testing & aeronautical navigation instruments & standard weights & measures

H

Hagan Corp., 600 Bowman Bldg., Pittsburgh, Pa.
Combustion control equipment
Haines Gauge Co., 119 South 4th St., Philadelphia, Pa.
Dial micrometer gage
Halldorson Co., 4500 Ravenswood Ave., Chicago, Ill.
Laboratory transformers
Halliburton Oil Well Cementing Co., Duncan, Okla.
Oil well surveying instruments
Hamilton Mfg. Co., Two Rivers, Wis.
Laboratory furniture
Hanlon-Waters, Inc., Box 1559, Tulsa, Okla.
Pressure & level controls, time cycle controllers
Hanniffin Mfg. Co., 621 So. Kolmer Ave., Chicago, Ill.
Valve operating devices
Hanovia Chemical & Mfg. Co., 90 Chestnut St., Newark, N. J.
Quartz mercury arc lamps
Hardwick, Hindle, Inc., 40 Hermon St., Newark, N. J.
Resistors
Hart Manufacturing Co., 110 Bartholomew Ave., Hartford, Conn.
Thermostats, remote control switches, magnetic relays, heater switches, motor control switches, mercury tube relays
Hart Mfg. Co., R. E., 416 Ward Bldg., Battle Creek, Mich.
Production counters
Hart Moisture Gauges, Inc., 126 Liberty St., New York, N. Y.
Kaydel moisture gages.
Hasler-Tel Co., 30 Vesey St., New York, N. Y.
Speed indicators, portable, chronometric
Hathaway Instrument Co., 517 S. University Blvd., Denver, Colo.
Instruments & apparatus for electrical & mechanical measurements & control.
Hausser & Son, C. A., 6040 Belfield Ave., Philadelphia, Pa.
Hayes Scientific Appliances, 202 N. Broadway, Urbana, Ill.
Scientific instruments
Hays Corp., P. O. Box 299, Michigan City, Ind.
Combustion instruments & automatic combustion controls

Hayward, H. N., 612 W. Oregon St., Urbana, Ill.
Tachometer Testers

H-B Electric Co., Inc., 2501 N. Broad St., Philadelphia, Pa.
Mercury tube relays

H-B Instrument Co., Inc., 2501 N. Broad St., Philadelphia, Pa.
Thermometers & hydrometers, remote control equipment

HD Electric Co., 100 W. Monroe St., Chicago, Ill.
Split core ammeters

Hebler Co., W. O., Central at Long Ave., Hillside, N. J.
Electrical gas analyzers

Heil Chemical & Mfg. Co., 216 S. 4 St., St. Louis, Mo.
Laboratory Supplies

Heiland Research Corp., 700 Club Bldg., Denver, Colo.
Geophysical & industrial instruments

Heise Bourdon Tube Co., 275 Noble Ave., Bridgeport, Conn.
Bourdon tube devices

Hellige, Inc., 3718 Northern Blvd., Long Island City, N. Y.
Scientific instruments, laboratory & bacteriological supplies

Henderson & Co., H. B., East Liverpool, Ohio
Pyrometric cones

Henschel & Co., Inc., John, 105 E. 29th St., New York, N. Y.
Drawing instruments

Henszey Co., Watertown, Wis.
Feed water meters, flow indicators continuous blowdown, heat exchangers and boiler feed regulators. Also meters and flow indicators for corrosive chemicals

Heusser Instrument Mfg. Co., 134 West Second South St., Salt Lake City, Utah
Analytical balances

Hewlett-Packard Co., 367 Addison Ave., Palo Alto, California.
Electronic equipment

Heyman Co., 157 Chambers St., New York, N. Y.
Inspection Instruments

H & H Thermostats, Inc., 270 Lafayette St., New York, N. Y.

Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland, Ohio
Electric indicating instruments

Hoffman Co., S. O., 835 Howard St., San Francisco, Calif.
Bolometers

Hoke, Inc., 585 Eagle Ave., New York, N. Y.
Regulators

Holtzer-Cabot Electric Co., 125 Amory St., Boston, Mass.
Fractional Horsepower Motors

Hoskins Mfg. Co., 4445 Lawton Ave., Detroit, Mich.
Thermo-couples, heating elements, pyrometers & electric furnaces

Houser Engg. & Mfg. Inc., 123 N. Main St., Bluffton, Ind.
Miles per Gallon Meter

Howard Clock Products, Inc., 256 Charles St., Waltham, Mass.
Observatory & seismological clocks.

Howe & French, Inc., 99 Broad St., Boston, Mass.
Laboratory supplies

Howe Scale Co., Rutland, Vt.
Scales

Humboldt Mfg. Co., 2014 N. Whipple St., Chicago, Ill.
Cement & concrete testers

Hunt & Son, C. B., Salem, Ohio
Valves & valve operating devices.

Hydraulic Press Co., Mount Gilead, Ohio
Pressure controls

Hy Ef Electrical Products Mfg. Co., 1515 West Pico, Los Angeles, Calif.
Automobile service station instruments

I

Ideal Commutator Dresser Co., 1420 Park Ave., Sycamore, Ill.
Insulation testers & revolution counters

Illinois Engineering Co., Racine Ave. & 20th Pl., Chicago, Ill.
Regulating valves

Illinois Testing Laboratories, Inc., 420 North La Salle St., Chicago, Ill.
Indicating pyrometers, resistance thermometers, pyrometer controllers, air velocity meters, metal detectors.

Impact Register Co., 315 So. Neil St., Champaign, Ill.
Instruments for determining and recording impacts received by railroad cars and riding qualities of railroad cars, automobiles

Improved Gauge Mfg. Co., 101-105 Canal St., Syracuse, N. Y.
Bourdon gages

Indicating Calipers Corp., 506 East 19th St., New York, N. Y.
Indicating calipers

Industrial Engineering Corp., Evansville, Ind.
Relays

Industrial Instrument Co., 2249 14th St., S. W., Akron, Ohio
Temperature, pressure & time cycle controllers, indicating & dial thermometers, diaphragm valves.

Industrial Instruments, Inc., 156 Culver Ave., Jersey City, N. J.
Electrical measuring & test equipment

Industrial-Scientific Supply Co., 828½ Monroe St., Fort Worth, Texas
Laboratory Supplies

Industrial Timer Corp., 101 Edison Place, Newark, N. J.
Industrial Timers

Industrial X-Ray Co., 1613 Second Ave., Seattle, Wash.
X-Ray Equipment

Industro-Scientific Co., 340 So. Camac St., Philadelphia, Pa.
Valentine refractometers & PQ viscosimeters

Inferno Co., Box 1138, Shreveport, La.
Combustion instruments

Instrument Resistors, Inc., 375 Main St., Little Falls, N. J.
Wire wound resistors

Instrument Specialties Co., Inc., 379 Main St., Little Falls, N. J.
Precision micrometer

International Business Machines Corp., 590 Madison Ave., New York, N. Y.
Scales & time instruments

International Equipment Co., 352 Western Ave., Boston, Mass.
Analytical centrifuges

International Filter Co., 325 W. 25th Place, Chicago, Ill.
Hydraulic measurement & control & chemical feeding & proportioning.

International Register Co., 25 South Throop St., Chicago, Ill.
Coin meters—timers for electric ranges & gas ovens.

International Resistance Co., 401 N. Broad St., Philadelphia, Pa.
Metallized & wirewound fixed & variable resistors including high voltage & high frequency types.

J

Jackson Electrical Instrument Co., 129 Wayne Ave., Dayton, Ohio
Radio testing equipment

Jacobs Bros. Co. Inc., 1 Main St., Brooklyn, N. Y.
Scales

Jaeger Watch Co., Inc., 304 East 45th St., New York, N. Y.
Automobile clocks, timepieces for aviation and marine, chronometric tachometers & true airspeed indicators

Jardur Import Co., 21 W. 19th St., New York, N. Y.
Chronographs & stop-watches

Jarrell-Ash Co., 165 Newburg St., Boston, Mass.
Representatives for Adam Hilger, Ltd., manufacturers of optical instruments

J B L Instrument Ct., P. O. Box 135, Darby, Pa.
Rotary instrument switches, transformer tapping, railway signal gear, decade resistance boxes

J-B-T Instruments, Inc., 441 Chapel St., New Haven, Conn.
Electrical measuring & controlling instruments: pyrometers, thermocouples, selector switches, potentiometers, resistance thermometers, laboratory instruments

Jeffrey Mfg. Co., Columbus, Ohio
Weighting, feeding, batching & proportioning equipment

Jenkins Bros., 80 White St., New York, N. Y.
Regulating valves

Jensen Instrument Co., 335 Central Ave., Los Angeles, Calif.
High pressure manometer

Johnson Service Co., 507 E. Michigan St., Milwaukee, Wisc.
Automatic temperature & humidity control for heating, cooling, ventilating, air conditioning & industrial processes

Johnson-Williams, Ltd., Box 8, Palo Alto, Calif.
Combustible gas indicators & alarm systems, portable & continuous, including accessories

Johnston & Jennings Co., 877 Addison Rd., Cleveland, Ohio
Oil meters

Johnston Manufacturing Co., 2823 E. Hennepin Ave., Minneapolis, Minn.
Furnace controls

Jones & Lamson Machine Co., Clinton & Whitmore Sts., Springfield, Vt.
Optical comparators

Jones Motrola Sales Co., 432 Fairfield Ave., Stamford, Conn.
Tachometers

Jones-Orme Co., 1645 Hennepin Ave., St. Paul, Minn.
Audio frequency standard signal generators, oscillators, laboratory amplifiers & special audio frequency laboratory equipment

Jorgan Co., 65 Atlantic Ave., Rochester, N. Y.

Judson Governor Co., 38 Browns Race, Rochester, N. Y.
Governors

K

Kansas City Laboratory Supply Co., 1434 Wyandotte St., Kansas City, Mo.
Laboratory supplies

Karp Metal Products Co. Inc., 129 - 30th St., Brooklyn, N. Y.
Instrument panels

Kauffman-Lattimer Co., 263 N. Front St., Columbus, Ohio
Laboratory Supplies

Keller Mfg. Co., G. P., 2803 Colorado Ave., Santa Monica, Calif.
Balances & weights of precision

Kelley-Koett Mfg. Co. Inc., Covington, Ky.
X-Ray apparatus

Kellogg Switchboard & Supply Co., Clearing Station, Chicago, Ill.
Relays

Kenyon Instrument Co., Inc., 273 New York Ave., Huntington, L. I., N. Y.
Airport & marine instruments

Kern Co., 136 Liberty St., New York, N. Y.
Surveying & astronomical instruments

Kessler Co., Walter H., 213 Pearl St., New York, N. Y.
Thermometers and hydrometers

Keuffel & Esser Co., Adams & Third Sts., Hoboken, N. J.
Surveying instruments

Kewaunee Mfg. Co., 106 Lincoln St., Kewaunee, Wis.
Laboratory furniture

Kieley & Mueller, Inc., 40 W. 13th St., New York, N. Y.
Pressure regulating & flow control devices

Kimball Co., W. W., 420 Kimball Bldg., Chicago, Ill.
Laboratory furniture

Kimble Glass Co., Vineland, N. J.
Glass apparatus, glass tubing, thermometers, hydrometers

King-Seeley Corp., 302 Second St., Ann Arbor, Mich.
Fuel level, oil pressure & temperature gages; also ammeters & voltmeters

Klett Mfg. Co., 179 E. 87th St., New York, N. Y.
Colorimeters

Klingerit, Inc., 16 Hudson St., New York, N. Y.
Liquid level gages

Klipfel Mfg. Co., 2641 W. Harrison St., Chicago, Ill.
Regulating valves

Knopf, Paul, 43 Ave. & 37 St., Long Island City, N. Y.
Registering instruments for vehicles

Knowles Scale Works, Lowell, Mass.
Platform, counter & beam scales

Koch & Co., F. A., 72 Spring St., New York, N. Y.

Kolesch & Co., 138 Fulton St., New York, N. Y.
Surveying instruments

Kollmorgen Optical Co., 767 Wythe Ave., Brooklyn, N. Y.
Astronomical & optical instruments

Kollsman Instrument Div., Square D Co., 8008 - 45th Ave., Elmhurst, Long Island, N. Y.
Precision instruments for aircraft

Kron Co., Bridgeport, Conn.
Scales

Krouse Testing Machine Co., 101 E. Dominion Blvd., Columbus, Ohio
Fatigue testing machines

Kuner Co., Max, 804 First Ave., Seattle, Wash.
Nautical instruments

Kurman Electric Co., Inc., 241 Lafayette St., New York, N. Y.
Relays, electrical test equipment, hearing devices

L

L. A. B. Corp., P. O. Box 162, Summit, N. J.
Special instruments

Laboratory Construction Co., 1113-15 Holmes St., Kansas City, Mo.
Laboratory furniture & apparatus

Laboratory Furniture Co., Inc., 37-18 Northern Blvd., Long Island City, N. Y.
Laboratory furniture

Laboratory Materials Co., 7319 Vincennes Ave., Chicago, Ill.
Laboratory supplies

Laboratory Specialties, Inc., 130 S. Wabash St., Wabash, Ind.

Lambert Meter Co., Inc., Plainfield, N. J.
Gas meters

Lammert & Mann Co., 260 N. Woods St., Chicago, Ill.
Flow regulators & valves

LaMotte Chemical Products Co., McCormick Bldg., Baltimore, Md.
Hydrogen ion apparatus

Lampkin Laboratories, Bradenton, Fla.
Radio-frequency meters

Landis & Gyr, Inc., 104 Fifth Ave., New York, N. Y.
Electric integrating meters; indicating & graphic demand meters for KW, KVA, reactive; prepayment meters; totalizing & remote; time switches; motor wound escapement or synchronous motor types with astronomic dials; miniature ball bearings

Lantz-Phelps Corp., 420 Linden Ave., Dayton, Ohio
Automotive test instruments

Pine & Co., Arthur S., 114 W. Hubbard St., Chicago, Ill.
Laboratory supplies
Relay Co., 5915 Avalon Blvd., Los Angeles, Calif.
Relays
Leeds & Northrup Co., 4970 Stenton Ave., Philadelphia, Pa.
Electrical measuring instruments for both laboratory & plant. For laboratory: bridges, galvanometers, potentiometers, photometric equipment, test sets & standards. For plant: indicators, recorders & controllers for chemical concentration, CO_2, current, electrolytic conductivity, frequency, gas analysis, humidity, Kw, Rkva, light, electrical load, pH, pressure, pyrometry, radiation, smoke density, speed, temperature, voltage. Speedomax Recorders, Centrimax Flowmeters & Metermax Combustion control Systems
Leitz, Inc., E., 730 Fifth Ave., New York, N. Y.
Optical instruments
Lenox Instrument Co., 2010 Chancellor St., Philadelphia, Pa.
Optical and technical instruments
Leslie Co., Lyndhurst, N. J.
Pressure reducing valves, pump governors, temperature regulators
Leupold, Volpel & Co., 425 N. E. 70th Ave., Portland, Oregon
Recorders & indicators, for irrigation, power, waterworks, sewerage. Equipment for hydraulic laboratories. Snow-rain recorders, hydrographic accessories, transits, levels
Lewis Engineering Co., 52 Rubber Ave., Naugatuck, Conn.
Portable pyrometers, potentiometers, resistance thermometers & other electrical temperature measuring devices
Kaydel moisture gages
Lewyt Metal Products, 112 Lafayette St., New York, N. Y.
Instrument housings
Lincoln Meter Co., Springfield, Ill.
Thermal ampere demand & watt demand meters, indicating & graphic
Lindberg Engineering Co., 221 North Laflin St., Chicago, Ill.
Electric power input controls
Link Engineering & Mfg. Co., 1054 W. Baltimore Ave., Detroit, Mich.
Spring testers
Lipman Engineering Co., 415 Van Braam St., Pittsburgh, Pa.
Photoelectric counters
Liquidometer Corp., 36-16 Skillman Ave., Long Island City, N. Y.
Liquid level gages
Littelfuse, Inc., 4757 Ravenswood Ave., Chicago, Ill.
Low range precision fuses & fuse mountings
Lord Mfg. Co., 1316 Holland Ave., Erie, Pa.
Vibration proof mountings & flexible couplings for practical horsepower motors
Luers, J. Milton, 12 Pine St., Mt. Clemens, Mich.
Timers
Lufkin Rule Co., Saginaw, Mich.
Precision tools & measuring tapes
Lumenite Electric Co., 37 West Van Buren St., Chicago, Ill.
Photoelectric controls
Lundquist Tool & Mfg. Co., 57 Jackson St., Worcester, Mass.
Ammeters
Lux Clock Mfg. Co., Inc., 95 Johnson St., Waterbury, Conn.
Automatic timers & clock mechanisms
Luxtrol Co., Inc., 54 West 21st St., New York, N. Y.
Photoelectric apparatus

M

Macbeth Daylighting Corp., 227 West 17th St., New York, N. Y.
Daylight Lamps for titration & color matching
Machlett & Son, E., 220 East 23rd St., New York, N. Y.
Laboratory apparatus & supplies
Magnaflux Corp., 605 W. Washington St., Chicago, Ill.
Magnetic inspectors
Magnatrol Valve Corp., 52 Beekman St., New York, N. Y.
Valves
Magnavox Co., Inc., Fort Wayne, Indiana
Electrolytic capacitors
Magnetic Analysis Corp., 42-44 12th St., Long Island City, N. Y.
Magnetic inspectors for uniform cross-sectional steel
Magnetic Gauge Co., 60 E. Bartges St., Akron, Ohio
Continuous gages, sheet & strip
Mahady Co., E. P., 857 Boylston St., Boston, Mass.
Mahoney, James A., 140 West 42nd St., New York, N. Y.
Products of glass
Marine Compass Co., Bryantville, Mass.
Marine instruments
Maris Co., John M., 528 Arch St., Philadelphia, Pa.
Marsh Corp., Jas. P., 2073 Southport Ave., Chicago, Ill.
Indicating gages, recording gages, dial thermometers, recording thermometers, refrigeration service instruments, temperature controlling systems, valves for heating systems
Marston Co., C. A., 506 Washington St., Braintree, Mass.
Time study instruments
Martindale Electric Co., Box 2669, Lakewood Branch, Cleveland, Ohio
Insulation testers
Martin-Decker Corp., P. O. Box 571, Long Beach, Calif.
Torque gages & pull rod dynamometers
Mason-Neilan Regulator Co., 1190 Adams St., Boston, Mass.
Industrial control equipment for pressure temperature, flow, liquid level, combustion & ratio: diaphragm control valves; pressure & vacuum regulators; level controllers; pump speed governors; pump pressure regulators; pipe strainers
McAlear Mfg. Co., 1901 S. Western Ave., Chicago, Ill.
Manual & automatic controls for air, oil gas, steam, chemicals, pure food, acid & alkali
McCord Radiator & Mfg. Co., 2585 E. Grand Ave., Detroit, Mich.
Liquid meters for low flows
McCorkle Co., D. H., 6th & Bancroft Way, Berkeley, Calif.
Thermostats & electric gas valves
McDonnell & Miller, Room 1316, Wrigley Bldg., Chicago, Ill.
Boiler controls
McDonnell Odometer Co., 3501 So. Kedzie Ave., Chicago, Ill.
Counters
McFarlin Co., 29 West Marion Ave., Youngstown, Ohio
Leak detectors
McKesson-Doster-Northington Co., 1706 First Ave., Birmingham, Ala.
Laboratory supplies
McNab of Bridgeport, Inc., Bridgeport, Conn.
Marine appliances, torsionmeters, salinity indicators, revolution counters
McNeill Engineering Equipment Co., T. W., 4057 West Van Buren St., Chicago, Ill.
Smoke alarms
Measurements Corp., Boonton, N. J.
Radio Frequency Testing & Measuring Devices
Mellophone Corp., 714 University Ave., Rochester, N. Y.
Rectifiers
Mercoid Corp., 4201 Belmont Ave., Chicago, Ill.
Automatic controls for heating, refrigeration, air conditioning, & various industrial applications
Mercon Regulator Co., 2357 N. 29th St., Milwaukee, Wisc.
Power plant specialties in regulation of pressure, level, rate of flow, proportioning & temperature
Meriam Co., 1955 W. 112th St., Cleveland, Ohio
Manometers, draft gages, indicating flow meters for steam, oil, gas, air, water, tank liquid level gages
Merkle-Korff Gear Co., 214 North Morgan St., Chicago, Ill.
Motorized speed reducers: induction, synchronous, reversing, d-c., universal motors
Merrick Scale Mfg. Co., Autumn St., Passaic, N. J.
Automatic continuous weighing machines
Merritt Engg. & Sales Co., Inc., 120 So. Niagara St., Lockport, N. Y.
Consistency controls
Meter Devices Co., 1001 Prospect Ave., S. W., Canton, Ohio
Electrical test devices
Meyer, Max, 76 Willoughby St., Brooklyn, N. Y.
Meyer Governor Co., 284 Baker Bldg., Minneapolis, Minn.
Long-distance recording, indicating, and contact-making instruments; gage pulsation protectors
Meylan, A. R. & J. E., 264 West 40th St., New York, N. Y.
Stop watches
M-G Gage Co., 107 Franklin St., Syracuse, N. Y.
Snap gages
Mico Instrument Co., 10 Arrow St., Cambridge, Mass.
Precision devices in industrial & scientific fields
Microchemical Service, 30 Van Zandt Ave., Douglaston, N. Y.
Microchemical laboratory apparatus
Micro Switch Corp., Spring St., Freeport, Illinois
Snap action switches
Mid-West Dynamometer & Engg. Co., Western Ave., at 60 St., Chicago, Ill.
Dynamometers
Miles Reproducer Co., 812 Broadway, New York, N. Y.
Microphones, sound recorders, amplifiers for industry.
Millen Mfg. Co., James, 150 Exchange St., Malden, Mass.
Radio test instruments
Miller Co., B. F., P. O. Box 455, Trenton, N. J.
Electrical testing devices
Miller Corp., Wm., 362 W. Colorado St., Pasadena, Calif.
Machine shop gages
Millers Falls Co., Greenfield, Mass.
Machine shop gages
Million Radio & Television, 685 West Ohio St., Chicago, Ill.
Radio & allied testing instruments
Milwaukee Gas Specialty Co., 2025 W. Clybourn, Milwaukee, Wis.
Valves, fittings & safety shut-offs for gas fired equipment
Minerallac Electric Co., 25 N. Peoria St., Chicago, Ill.
Potential detectors
Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh, Pa.
Instruments for the detection, analysis & recording of toxic and combustible gases; instruments for sampling, counting & measuring dust particles
Mine & Smelter Supply Co., 1422-17th St., Denver, Colo.
Industrial equipment & supplies
Minneapolis Elec. & Construction Co., 80 South 12th St., Minneapolis, Minn.
Wire length measuring machines
Minneaapolis-Honeywell Reg. Co., 2727 - 4 Ave., S. Minneapolis, Minn.
Heating, ventilating and air conditioning control equipment; thermostats; safety controls; motor and diaphragm operated valves; relays; furnace controllers
Moeller Instrument Co., 132nd St. & 89th Ave., Richmond Hill, N. Y.
Thermometers, hydrometers, etc.
Moist-O-Meter, Inc., Board of Trade Bldg., Kansas City, Mo.
Moisture testers
Moisture Register Co., 1029 N. Sycamore Ave., Los Angeles, Calif.
Moisture testing instruments & devices
Moline Furniture Works, Moline, Ill.
Laboratory furniture
Monarch Manufacturing Co., 3341 Belmont Ave., Chicago, Ill.
Radio set testers
Monitor Controller Co., Gay, Lombard & Frederick Sts., Baltimore, Md.
Electrical controllers
Morehouse Machine Co., York, Penna.
Proving rings
Morey and Jones, Ltd., 922 So. Hemlock St., Los Angeles, Calif.
Recording & indicating flow meters
Morse Twist Drill & Machine Co., New Bedford, Mass.
Gear testers
Mott-Smith Corp., 1505 Shell Bldg., Houston, Texas
Geophysical instruments
Munsell Color Co., Inc., 10 E. Franklin St., Baltimore, Md.
Color comparators
Muter Company, 1255 S. Michigan Ave., Chicago, Ill.
Radio & electrical products

N

Nashville Surgical Supply Co., 401 Church St., Nashville, Tenn.
Nathan Mfg. Co., 250 Park Ave., New York, N. Y.
Valves
National Airoil Burner Co., 1284 E. Sedgley Ave., Philadelphia, Pa.
Liquid level controllers
National Aluminate Corp., 6216 West 66th St., Chicago, Ill.
Conductivity meters
National Brass Co., 1600 Madison St., S. E., Grand Rapids, Mich.
Combustion & draft controllers
National Electric Controller Co., 5305 Ravenswood Ave., Chicago, Ill.
Rheostats
National Engineering Products, Inc., Commerce & Savings Bldg., Washington, D. C.
Pressure gage equalizers
National Instrument Co., 44 School St., Boston, Mass.
Electro-mechanical instruments & devices
National Meter Co., 4207 First Ave., Brooklyn, N. Y.
Water, oil & gasoline meters
National Research Corp., 100 Brookline Ave., Boston, Mass.
Optical products
National Scientific Corp., 2141 W. North Ave., Chicago, Ill.
National Technical Labs., 820 Mission St., Pasadena, Calif.
Beckman pH instruments and electro-metric pH equipment for completely automatic indication, control & recording of pH in large scale industrial processes
Natural Gas Equipment Inc., 541 Petroleum Securities Bldg., Los Angeles, Calif.
Furnace controllers
Negus, T. S. & J. D., 69 Pearl St., New York, N. Y.
Nautical instruments
Nelson Section Liner Co., 727 N. Seventh St., DeKalb, Ill.
Drawing instrument
Nelson Vacuum Pump Co., Geo. F., 2133 Fourth St., Berkeley, Calif.
High vacuum pumps
Neptune Meter Co., 50 W. 50th St., New York, N. Y.
Liquid meters
Newark Scale Works, 10-12 Hobson St., Newark, N. J.
Scales
N. J. Laboratory Supply Co., 235 Plane St., Newark, N. J.
Laboratory supplies
New Jersey Meter Co., Plainfield, N. J.
Compressed air meters, separators for removing water & oil from compressed air lines, liquid flow indicators with low flow signalling circuit.

N. Y. Laboratory Supply Co., Inc., 530 Broadway, New York, N. Y.
Laboratory supplies

New York Scientific Supply Co., 111 East 22nd St., New York, N. Y.
Laboratory supplies

Niagara Electrical Instrument Co., 725 Genesee Bldg., Buffalo, N. Y.
Electrical power analyzer

Niehoff & Co., C. E., 4925 Lawrence Ave., Chicago, Ill.
Auto test equipment

Northern Equipment Company, 1945 Grove Drive, Erie, Pa.
Boiler feed control

Norton Co., Worcester, Mass.
Refractory laboratory ware, porous plates & tubes

Norton Electrical Instrument Co., 101 Hilliard St., Manchester, Conn.
Electrical instruments

Nurnberg Thermometer Co., Inc., 397 Bridge St., Brooklyn, N. Y.
Thermometers & Hydrometers

Nye, Inc., Wm. F., New Bedford, Mass.
Instrument & watch oils

O

Ohio Injector Co., 3 Main St., Wadsworth, Ohio
Check valves

Ohmer Fare Register Co., 740 Bolander Ave., Dayton, Ohio
Mileage recorders

Ohmite Mfg. Co., 4826 W. Flournoy St., Chicago, Ill.
Close control rheostats, fixed & adjustable power resistors, precision & non-inductive resistors, attenuators, tap switches and R. F. chokes.

Olsen Testing Machine Co., Tinius, 500 N. 12th St., Philadelphia, Pa.
Testing machines

Omega Machine Co., 4010 Penn Ave., Kansas City, Mo.
Chemical feeding equipment for dry or liquid materials, by volume or by weight

Orton Jr. Ceramic Foundation, Edward, 1445 Summit St., Columbus, Ohio
Seger cones

P

Pacific Biological Labs., Pacific Grove, Calif.

Pacific Scientific Co., Inc., Bendix Bldg., Los Angeles, Calif.
Cable tension indicator

Pacific Specialty Co., 344 N. Vermont Ave., Los Angeles, Calif.

Palmer Co., 2501 Norwood Ave., Cincinnati, Norwood, Ohio
Industrial indicating "Red-Reading-mercury" thermometers & dial thermometers

Palo-Myers, Inc., 81 Reade St., New York, N. Y.
Laboratory supplies

Paragon Electric Co., 37 W. Van Buren St., Chicago, Ill.
Timers

Park Sales Co., 3 Park Place, New York, N. Y.
Micrometers and calipers

Parks-Cramer Co., Fitchburg, Mass.
Humidity, heat & air change control, wet bulb temperature regulators

Parr Instrument Co., 222 52nd St., Moline, Ill.
Combustion bombs, calorimeters, hydrogenation apparatus, melting point apparatus

Partlow Corp., 2 Campion Rd., New Hartford, N. Y.
Temperature indicators & controllers, time delay relays

Pastor Shop Watch Co., 43 East Main St., Waterbury, Conn.
Stop watches

Patterson Screen Co., Towanda, Pa.
X-Ray intensifying & fluoroscopic screens

Paulson & Co., Henry, 37 So. Wabash Ave., Chicago, Ill.
Watch checking instrument

Paulstick & Sons, H., 2124 Fulton St., Brooklyn, N. Y.
Thermometers

Paxer-Sills Co., 4101 Ravenswood Ave., Chicago, Ill.
Vehicular counters

Payne Furnace & Supply Co., Beverly Hills, Calif.
Domestic & commercial gas controls

Penberthy Injector Co., 1242 Holden St., Detroit, Mich.
Liquid level gages

Penn Electric Switch Co., Box 556, Goshen, Ind.
Automatic controls for pressure, temperature, humidity, liquid level; also mechanically actuated unit switches. Specialized controls for refrigeration, air conditioning, heating, pumps, air compressors.

Perfex Corp., 415 W. Oklahoma Place, Milwaukee, Wis.
Automatic temperature controls for oil burners, stokers, gas burners, refrigeration & air conditioning

Perkin-Elmer Corp., 90 Broad St., New York, N. Y.
Optical instruments

Perkins & Son, Inc., B. F., Holyoke, Mass.
Testers for leather, paper & textiles

Permutit Company, 330 West 42nd St., New York, N. Y.
Indicators & recorders for CO_2, specific gravity of natural, manufactured or process gases, exhaust gas analysis, other uses where gas density guides operation

Petrometer Corp., 4 Star Square, Long Island City, N. Y.
Distant reading, liquid level tank gages

Pfaltz & Bauer, Inc., Empire State Bldg., New York, N. Y.
Laboratory control instruments

Philadelphia Thermometer Co., 915 Filbert St., Philadelphia, Pa.
Instruments for temperature indication, control & regulation

Phipps and Bird, Inc., Richmond, Va.
Laboratory apparatus & chemicals

Photobell Corp., 123 Liberty St., New York, N. Y.
Photoelectric equipment

Photoswitch, Inc., 21 Chestnut St., Cambridge, Mass.
Industrial photoelectric controls including counting equipment, electronic timers & special electronic controls, smoke controls

Photovolt Corp., 10 East 40 St., New York, N. Y.
Photo-electric elements, photometers, electronic timing devices, photo-electric colorimeters, photo-electric exposure meters, densitometers

Pho-Tron Instrument Co., 5713 Euclid Ave., Cleveland, Ohio
Photoelectric colorimeters

Physicists Research Co., 343 S. Main St., Ann Arbor, Mich.
Specialists in solution of unusual industrial research jobs, with special experience in machinery noise reduction, development of special instruments, & measurement of surface irregularities

Pickering Governor Co., Portland, Conn.
Governors

Pierce Watch Company, 22 West 48th St., New York, N. Y.
Stop watches

Pioneer Instrument Division of Bendix Aviation Corp., Bendix, N. J.
Aircraft instruments

Pitometer Log Corp., 206 Lafayette St., New York, N. Y.
Pitot tube flowmeters

Pittsburgh Equitable Meter Co., 400 N. Lexington Ave., Pittsburgh, Pa.
Gas & liquid meters, gas pressure regulators & accessories

Pittsburgh Instrument & Machine Co., 1026 Reedsdale St., Pittsburgh, Pa.
Brinell Machines, alternating impact machines, surveying instruments

Pittsburgh Taximeter Co., Point Bldg., Pittsburgh, Pa.
Vehicle recorders

Pneumatic Scale Corp. Ltd., Norfolk Downs Station, Quincy, Mass.
Packaging scales

Pneumercator Co., Inc., 305 E. 46th St., New York, N. Y.
Level indicators

Polarized Light & Photoelastic Co., 55 W. 42nd St., New York, N. Y.
Photoelastic polariscopes

Polarized Products Corp., 153-16 Tenth Ave., Whitestone, L. I., N. Y.
Polarization plates

Polarizing Instrument Co., 630 Fifth Ave., New York, N. Y.
Photoelasticity apparatus

Post Company, Frederick, P. O. Box 803, Chicago, Ill.
Instruments & equipment for architect & engineer

Potter Co., 1950 Sheridan Rd., North Chicago, Ill.
Automotive service instruments

Powers Regulator Co., 2734 Greenview Ave., Chicago, Ill.
Controls for air conditioning, temperature & humidity; also water temperature controls, dial indicating & recording thermometers & steam traps

Practical Instrument Co., 2717 N. Ashland Ave., Chicago, Ill.
Recording thermometers & operation recorders

Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.
Machine shop instruments

Precision Apparatus Corp., 821 East New York Ave., Brooklyn, N. Y.
Radio test instruments
Machine shop gages

Precision Gage & Tool Co., 320 East 3rd St., Dayton, Ohio

Precision Resistor Co., 334 Badger Ave., Newark, N. J.
Resistors

Precision Scientific Co., 1736 N. Springfield Ave., Chicago, Ill.
Standard & custom-built laboratory equipment

Precision Thermometer & Instrument Co., 1434 Brandywine St., Philadelphia, Pa.
Scientific instruments

Precision Tube Company, 3824-26-28 Terrace St., Philadelphia, Pa.
Fine tubing & metal shielded wire

Preferred Utilities Mfg. Corp., 31 West 60th St., New York, N. Y.
Boiler plant instruments

Premier Crystal Laboratories, Inc., 63 Park Row, New York, N. Y.
Piezo electric quartz and tourmaline crystals, reactance & capacity meters

Process Controls, Inc., Le Roy, N. Y.
Paper industry controls

Production Instrument Co., 710 W. Jackson Bld., Chicago, Ill.
Electric & mechanical counting, timing & recording devices & actuating switches

Pyrometer Instrument Co., 103 Lafayette St., New York, N. Y.
Pyrometers for various purposes

R

Racine & Co., Jules, 20 West 47th St., New York, N. Y.
Stop watches

Radio City Products Inc., 88 Park Place, New York, N. Y.
Electrical & radio testing instruments & accessories

Radio Transceiver Labs., 8627 115th St., Richmond Hill, New York
High frequency radio transmitters & receivers

Ranco, Inc., 601 West Fifth Ave., Columbus, Ohio
Refrigeration controls

Randall, Frank E., 248 Ash St., Waltham, Mass.
Machinists' dial gages

Rascher & Betzold, 829-835 Orleans St., Chicago, Ill.
Laboratory supplies

Rawson Electrical Instrument Co., 110 Potter St., Cambridge, Mass.
Dynamometers, wattmeters, milliammeters & voltmeters. Also ultra-sensitive meters both for A.C. & D.C., fluxmeters, electrostatic voltmeters, Thermocouples in vacuum, earth current meters, cable testers, milli-second timers

Raytheon Mfg. Co., 190 Willow St., Waltham, Mass.
Automatic & manually controlled rectifiers for all communication, industrial or laboratory applications

R. C. A. Manufacturing Co., Inc., Camden, N. J.
Radio & electronic equipment for all purposes including laboratory & industrial apparatus

Read Machinery Co., Inc., York, Penna.
Chemical & Industrial Equipment

Reed Small Tool Works, 40 Dewey St., Worcester, Mass.
Machine shop micrometers

Refinery Supply Co., 621 East Fourth St., Tulsa, Okla.
Gas testing instruments & specialties for oil & gas industry; & laboratory supplies

Refrigerating Specialties Co., 728 So. Sacramento Blvd., Chicago, Ill.
Automatic valves & regulators

Rehtron Corp., 2159 Magnolia Ave., Chicago, Ill.
Photoelectric equipment

Reliance Gauge Column Co., 5902 Carnegie Ave., Cleveland, Ohio
Steam specialties

Reliance Instrument Co., 1135 W. Van Buren St., Chicago, Ill.
Electrical instruments

Remler Company, Ltd., 2101 Bryant St., San Francisco, Calif.
Radio & inter-communicating systems

Republic Flow Meters Co., 2249 Diversey Parkway, Chicago, Ill.
Remote reading flow meters, complete line of power plant & industrial instruments for the measurement of flow, level, pressure, draft, temperature & Co_2. Automatic boiler controls, regulators, valves and desuperheaters

Rex Rheostat Co., 37 West 20th St., New York, N. Y.
Protected & unprotected slide-contact rheostats & adjustable, wire wound resistors

Reynolds Gas Regulator Co., Anderson, Ind.
Automatic valves & regulators

Rhamstine, J. Thos., 301 Beaubien St., Detroit, Mich.
Photoelectric cell equipment

Rhodes, Inc., M. H., 30 Bartholomew Ave., Hartford, Conn.
Time switches

Richardson Scale Co., Clifton, N. J.
Automatic weighing machinery

Riehle Testing Machine Division, American Machine & Metals Inc., East Moline, Ill.
Testing machines & testing instruments for tension, compression, bending, torsion, shear, hardness, wear

Rieker Instrument Co., 1919 Fairmount Ave., Philadelphia, Pa.
Scientific instruments

Ring-Balance Instrument Co., 2511 W. 24th St., Chicago, Ill.
Flow meters, draft & pressure gages for low pressure gas & air measurements. Recording, indicating & integrating in any combination

Riverbank Laboratories, Geneva, Ill.
Tuning forks

Robertson & Co., John H., 1767 W. Armitage Ave., Chicago, Ill.

Robertson, 3rd, J. L., 116 Broad St., New York, N. Y.
Engine indicator accessories

Robertshaw Thermostat Co., Youngwood, Pa.
Thermostats

Robinson Orifice Fitting Co., 1435 Santa Fe Ave., Los Angeles, Calif.
Orifice fittings & plates

Rochester Mfg. Co., Inc., Rochester, N. Y.
Pressure & liquid level indicators & thermometers

Rockwell Co., Stanley P., 296 Homestead Ave., Hartford, Conn.
Dilatometers

Rogear Co., 11 Water St., New York, N. Y.

Mullen Testers

There are occasions when the texture as well as the excessive bursting strength of a material requires a machine of unusual strength and rigidity. Model A Jumbo Mullen Tester meets these requirements 100 per cent.

B. F. PERKINS & SON, INC.

Engineers and Manufacturers

HOLYOKE, MASS.

ROLLER-SMITH

Makes Instruments

Of All Types for All Purposes

INDICATING and GRAPHIC

Also

- Air and Oil Circuit Breakers
- Instrument and Control Switches
- Current Transformers
- Switchboards
- Relays

Send for Catalogs

Electrical Measuring and Protective Apparatus

ROLLER-SMITH COMPANY BETHLEHEM, PENNA.

Sales Agencies in Principal Cities in U. S. and Canada

Roller-Smith Co., Bethlehem, Pa.
Instruments (indicating & graphic), air & oil circuit breakers, relays, switchboards, precision balances, transformers, instrument & control switches

Rowe Radio Research Laboratory Co., 1103 Bryn Mawr Ave., Chicago, Ill.
Specialized industrial & laboratory equipment, Electro-mechanical & electronic devices

Rubicon Co., 29 N. Sixth St., Philadelphia, Pa.
Precision electrical instruments: potentiometers, galvanometers, bridges, resistance standards, for standardization, research, calibration of meters, production testing, & educational applications. Photoelectric colorimeters, transmission dynamometers & other special apparatus

Rueckert Manufacturing Co., 69 Sprague St., Providence, R. I.
Cases for instruments

Ruehfel Co., Inc., George, 103-105 Menahan St., Brooklyn, N. Y.
Laboratory instruments & apparatus

Rupp & Bowman Co., 315 Superior St., Toledo, Ohio
Laboratory supplies

Ruska & Co., Inc., Walter, 2332 Bellaire Blvd., Houston, Texas
Geophysical instruments

Ruth Glass Div., Kimble Glass Co., Conshohocken, Pa.
Laboratory glassware

S

Sangamo Electric Company, Springfield, Ill.
Electric meters of all types; also instrument transformers, time-switches & radio condensers.

Sarco Company, Inc., 183 Madison Ave., New York, N. Y.
Temperature regulators

Sargent & Co., E. H., 155 E. Superior St., Chicago, Ill.
Laboratory supplies & chemicals

Saxl Instrument Co., Inc., 42 Weybosset St., Providence, R. I.
Precision instruments

Schaar & Co., 754 W. Lexington St., Chicago, Ill.
Laboratory supplies

Schade Valve Mfg. Co., 2527 N. Bodine St., Philadelphia, Pa.
Automatic valves

Schaefer Bros. Co., 1059 W. 11th St., Chicago, Ill.
Rheostats

Schaffer Poldometer Co., 2828 Smallman St., Pittsburgh, Pa.
Scales

Scherr Co., Inc., George, 128 Lafayette St., New York, N. Y.
Optical measuring & inspection equipment

Schutte & Koerting Co., 12th & Thompson Sts., Philadelphia, Pa.
Rotameters

Schwein Engg. Co., L. N., 5736 Washington Blvd., Los Angeles, Calif.
Aircraft instruments & pressure control instruments

Scientific Apparatus Co., 4 Landscape Ave., Yonkers, N. Y.
Laboratory apparatus

Scientific Glass Apparatus Co., Bloomfield, N. J.
Glass apparatus & interchangeable ground glass joints

Scientific Instrument Co., 1441 Walnut St., Berkeley, Calif.
Current meters

Scientific Instrument Co., 535 W. Larned St., Detroit, Mich.
Industrial & laboratory thermometers; hydrometers; special laboratory apparatus

Scientific Supplies Co., 123 Jackson Ave., Seattle, Wash.
Laboratory supplies

Scott Co., Henry L., Blackstone & Culver Sts., Providence, R. I.
Physical testing machines

Seederer-Kohlbusch, Inc., 149-151 New York Ave., Jersey City, N. J.
Analytical balances & weights

Selas Co., 18th & Indiana Ave., Philadelphia, Pa.
Indicating flow meters

Selsi Co., Inc., 43 W. 23rd St., New York, N. Y.

Sensitive Research Instrument Corp., 4545 Bronx Blvd., New York, N. Y.
Electrical instruments measuring quantities or values of small current or voltage

Service Recorder Co., 1422 Euclid Ave., Cleveland, Ohio
Vehicle recorders

Shallcross Controls, Inc., 3707 N. Richards St., Milwaukee, Wisc.
Furnace controls

Shallcross Manufacturing Co., 10 Jackson Ave., Collingdale, Penna.
Rotary Selector Switches with solid silver contacts, accurate instrument resistors 0.1% — 5%, decade resistances & standards, bridges, telephone transmission test sets, resistance thermometers, bonding testers & special instruments for electrical measurements

Shawmut Engg. Co., 179 Freeport St., Boston, Mass.
Abrasion testers

Sheffield Gage Corp., 15 E. 3 St., Dayton, Ohio
Machine shop gages

Sheldon & Co., E. H., Muskegon, Mich.
Laboratory furniture

Sheldon Electric Corp., 100 Fifth Ave., New York, N. Y.
Photoelectric color matching machines

Shore Instrument & Mfg. Co., Van Wyck & Carll St., Jamaica, N. Y.
Scleroscope hardness testers

Shure Brothers, 225 West Huron St., Chicago, Ill.
Vibration pick-ups

Sickles Co., F. W., Springfield, Mass.
Electrical products

Sigma Instruments, Inc., 388 Trapelo Rd., Belmont, Mass.
Relays

Simmonds Aerocessories, Inc., 551 Fifth Ave., New York, N. Y.
Specialized aeronautical and engineering accessories

Simplex Time Recorder Co., Sanborn St., Gardner, Mass.

Simplex Valve & Meter Co., 68th & Upland Sts., Philadelphia, Pa.
Flow controls, meters, gages proportioning & ratio control equipment

Simpson Electric Co., 5216 Kinzie St., Austin Station, Chicago, Ill.
Electrical instruments

Sjostrom Co., John E., 1711 N. Tenth St., Philadelphia, Pa.
Laboratory furniture

Slocomb Co., J. T., 35 Oxford St., Providence, R. I.
Micrometer calipers

Sodemann Heat & Power Co., 2300 Delmar Blvd., St. Louis, Mo.
Air conditioned moist cabinet

Sola Electric Co., 2525 Clybourn Ave., Chicago, Ill.
Transformers, automatic voltage adjusters

Soltmann Inc., E. G., 250 East 43rd St., New York, N. Y.
Drawing & engineering materials

Sound Apparatus Co., 150 West 46th St., New York, N. Y.
Sound measuring equipment

Southwestern Electronics Labs., 2326 Guadalupe St., Austin, Tex.
Electronic equipment

Southern Desk Co., Hickory, N. C.
Laboratory furniture

Sparling, R. W., 945 N. Main St., Los Angeles, Calif.
Liquid meters

Specialty Glass Co., 536 Lake Shore Drive, Chicago, Ill.
Laboratory glassware

Speedometer Service Co., 131 Fell St., San Francisco, Calif.
Survey footmeter

Speidel & Co., Chas. W., 112 N. 12th St., Philadelphia, Pa.
Surveying instruments

Spence Engineering Co., Inc., 53 Grant St., Walden, N. Y.
Regulating valves

Spencer Lens Co., 19 Doat St., Buffalo, N. Y.
Microscopes, still projection equipment, instruments for measuring optical properties, crime detection instruments, & lenses, prisms & reflectors.
Spencer Thermostat Co., 34 Forest St., Attleboro, Mass.
Thermostatic controls, temperature & pressure switches & relief valves, relays-thermal time delay
Sperry Gyroscope Co., Inc., Manhattan Bridge Plaza, Brooklyn, N. Y.
Aircraft & marine navigational instruments
Sperry Products, Inc., 1505 Willow Ave., Hoboken, N. J.
Special railway testers
Sperry-Sun Well Surveying Co., 1608 Walnut St., Philadelphia, Pa.
Underground surveying instruments for oil wells
Sprague Meter Co., 35 South Ave., Bridgeport, Conn.
Liquid meters
Spray Engg. Co., 114 Central St., Somerville, Mass.
Flowmeters
Standard Concrete Apparatus Co., 1422 Rhode Island Ave., Washington, D. C.
Concrete testing equipment
Standard Electrical Products Co., 317 Sibley St., St. Paul, Minn.
Relays
Standard Electric Time Co., 89 Logan St., Springfield, Mass.
Electric stop clocks, electric time systems, watt hour meter testing equipment, program clocks, laboratory jack panels & small laboratory table service panels.
Standard Engineering Works, 289 N. Main St., Pawtucket, R. I.
Humidstats
Standard Glass Apparatus Works, 2 Elm Place, Freeport, L. I., N. Y.
Standard Scientific Supply Corp., 34 W. 4 St., New York, N. Y.
Laboratory supplies
Standard Thermometer, Inc., 65 Shirley St., Boston, Mass.
Mechanical thermometers
Star Brass Mfg. Co., 104 E. Dedham St., Boston, Mass.
Pressure & vacuum gages, gage testers
Star Compass Co., 110 Antwerp St., East Milton, Mass.
Compasses
Starrett Co., L. S., Athol, Mass.
Precision tools, dial indicators & steel tapes
States Co., Hartford, Conn.
Electricity meter testers
Steel City Testing Laboratory, 8843 Livernois Ave., Detroit, Mich.
Testing machines
Sterling Engineering Co., 3738 North Holton, Milwaukee, Wisc.
Motor operated valves
Stets Company, 141 Milk St., Boston, Mass.
Liquid level controllers, feed water regulators
Stewart-Warner Corp., 1826 Diversey Parkway, Chicago, Ill.
Tachometers
Sticht & Co., Herman H., 27 Park Pl., New York, N. Y.
Electrical instruments
Stillman Co., M. J., Suite 800, 116 So. Michigan Ave., Chicago, Ill.
Stop watches
Stockton Profile Gauge Corp., 165 Jackson St., Lowell, Mass.
Profile gages
Stoelting Co., C. H., 424 N. Homan Ave., Chicago, Ill.
Laboratory supplies
Stover-Lang Co., 280 Dover St., Boston, Mass.
Tachometers
Streeter-Amet Company, 4101 Ravenswood, Chicago, Ill.
Automatic measuring, weighing & counting machines
Stromberg Electric Co., 233 W. Erie St., Chicago, Ill.
Timing devices & time clocks
Struthers-Dunn see Dunn
Submarine Signal Co., 160 State St., Boston, Mass.
Sounding machines
Superior Electric Co., Bristol, Conn.
Industrial & laboratory apparatus
Supreme Electric Products Corp., 99 Mt. Hope Ave., Rochester, N. Y.
Solenoid valves, electro-magnets
Supreme Instruments Corp., Greenwood, Miss.
Radio testing equipment: tube testers, set testers, analyzers, test oscillators, oscilloscopes & dynamic instruments.
Suter, Alfred, 200 Fifth Ave., New York, N. Y.
Testing apparatus for textiles and metals
Syntron Co., Homer City, Pa.
Weigh feeder machines

T

Taber Instrument Co., 111 Goundry St., North Tonawanda, N. Y.
Testers for measuring wear & abrasion resistance of paints, electroplate, linoleum, leather, textiles; precision stiffness gages for paper, light metallic sheet & wire
Tagliabue Mfg. Co., C. J., Park & Nostrand Ave., Brooklyn, N. Y.
Indicating, recording & controlling instruments for temperature, pressure, level, flow, humidity, hydrogen ion, time-cycle, including charts & recording inks; ebullimometers; flow meters; hydrometers; hygrometers; manometers; moisture meters; grain, wood, tobacco; mercurial vacuum gages; oil testing instruments; potentiometers, indicating, self-balancing; pressure spring instruments, pyrometers, recorders, multiple point, high speed; recording pressure gages, relays, thermostatic; steam traps; switches, controller, rotary; thermocouples & pyrometer accessories; thermometers, chemical, dial-indicating, electrical, enclosed paper scale, industrial, recording, resistance; valves, Wheatstone & other bridges
Tally-Meter Co., 17 Elmwood Ave., Norwich, Conn.
Counters & measuring machines
Tamms Silica Co., 228 N. La Salle St., Chicago, Ill.
Pyrometers
Taylor & Co., Inc., W. A., 872 Linden Ave., Baltimore, Md.
Equipment for pH & chlorine control, control of phosphates in boiler water & for water analysis
Taylor Instrument Cos., 95 Ames St., Rochester, N. Y.
Indicating, Recording & Controlling Instruments for Temperature, Humidity, Pressure, Rate of Flow, & Liquid Level
Taylor Sales Co., 2330 West Clybourn St., Milwaukee, Wis.
Hydraulic dynamometers, static balancing machines, super-accurate drill presses
Tejax Engineering Corp., 2 Allens Ave., Providence, R. I.
Dial indicating handwheels, valve position indicators & V-port hand regulating valves
Televiso Co., 2400 N. Sheffield Ave., Chicago, Ill.
Electronic products; custom built equipment
Teleweld, Inc., 80 E. Jackson Blvd., Chicago, Ill.
Hardness testers
Tenney Engineering, Inc., 46 Farrand St., Bloomfield, N. J.
Controlled temperature & humidity ovens
Test-A-Tone Co., 274 Madison Ave., New York, N. Y.
Stethoscopes
Testing Machines, Inc., 460 West 34th St., New York, N. Y.
Physical testing machines
Testrite Instrument Co., 57 E. 11th St., New York, N. Y.
Scientific instruments
Thermal Syndicate Ltd., 12 East 46th St., New York, N. Y.
Apparatus, laboratory; flats, optical; gas & vapor discharge tubes, mercury; light sources, mercury vapor; light sources; ultra-violet; optical parts
Therm-Electric Meters Co., Inc., Box 604, Ithaca, N. Y.
Indicating & recording thermal wattmeters, ampere and KVA meters of rating 5 to 50 amps. self-contained. Test panels & test boards for meter testing
Thermo-Electric Co., 1012 W. Superior Ave., Cleveland, Ohio
Electrically heated & controlled paraffin baths
Thomas Clocks, Seth, Div. of General Time Instruments Corp., Thomaston, Conn.
Household clocks, outdoor & tower clocks, clock movements for industrial purposes, also electric timers
Thomas Co., Arthur H., West Washington Square, Philadelphia, Pa.
Dealers, retail-wholesale-export, in laboratory apparatus & reagents for laboratories of chemistry & biology.
Thompson Clock Co., H. C., Bristol, Conn.
Electric stop clocks & interval timers
Thordarson Electric Mfg. Co., 500 W. Huron St., Chicago, Ill.
Transformers
Thwing-Albert Instrument Co., 3323 Lancaster Ave., Philadelphia, Pa.
Pyrometers, paper testing instruments, portable pH meters, general testing instruments & machines
Tinsley Laboratories, 2035 Ashby Ave., Berkeley, Calif.
Astronomical instruments
Toledo Scale Co., 3216 Monroe St., Toledo, Ohio
Automatic scales for weighing, counting, check-weighing, compounding, force-measuring, weight-printing & weight-recording; & special devices for testing, classifying & standardizing.
Torsion Balance Co., 92 Reade St., New York, N. Y.
See Christian Becker, Inc.
Trerice Co., H. O., 1420 Lafayette Blvd., W., Detroit, Mich.
Industrial instruments
Triangle Package Machinery Co., 965 N. Spaulding St., Chicago, Ill.
Filling machines
Trill Indicator Co., 38 E. South St., Corry, Pa.
Engine indicators
Triner Sales Co., 1440 Merchandise Mart, Chicago, Ill.
Scales
Triplett Electrical Instrument Co., 135 E. College Ave., Bluffton, Ohio
Electrical measuring instruments & radio testing equipment. Also instruments for laboratory and industrial test purposes; switches, relays, resistors, shunts
Triumph Mfg. Co., 4017 W. Lake St., Chicago, Ill.
Radio test instruments
Troemner, Henry, 911 Arch St., Philadelphia, Pa.
Balances

U

Uehling Instrument Co., 14 Vesper St., Paterson, N. J.
CO_2 recorders, vacuum recorders, absolute pressure recorders, draft recorders, combined pressure & vacuum recorders, liquid level gages, pressure & vacuum gages, inclined draft gages, well-type direct reading manometers, U tube manometers, absolute pressure gages.
Ulanet Co., George, 86 E. Kinney St., Newark, N. J.
Thermostats
Ulmer Co., J. C., 1791 E. 38th St., Cleveland, Ohio
Surveying instruments
Unertl, John, 432 Cemetery Lane, Pittsburgh (9), Pa.
Optical instruments
Union Tool Company, Orange, Mass.
Machine shop gages
United Cinephone Corp., Torrington, Conn.
Electronic devices
United States Blue Print Paper Co., 207 S. Wabash Ave., Chicago, Ill.
Surveying instruments
United States Gauge Co., 44 Beaver St., New York, N. Y.
Indicating & recording pressure gages
United States Instrument Corp., 19 So. Harrison St., E. Orange, N. J.
Voice powered telephone equipment
United Transformer Corp., 150 Varick St., New York, N. Y.
Transformers
Universal Control Devices, 28 N. Loomis St., Chicago, Ill.
Photoelectric equipment
University Apparatus Co., 2229 McGee Ave., Berkeley, Calif.

V

Vacutron, Inc., 20 West 22nd St., New York, N. Y.
Special vacuum tubes; electronic circuits & industrial control devices
Valpey Crystals, P. O. Box 321, Holliston, Mass.
Quartz crystals for frequency control
Van Keuren Co., 12 Copeland St., Watertown, Mass.
Optical comparators & flats
Vapor Recovery Systems Co., 2820 Alameda St., Compton, Calif.
Liquid level indicators
Vaughn-G. E. Witt Co., 4224 Hollis St., Oakland, Calif.
Regulating valves
Veeder-Root, Inc., Sargent & Garden Sts., Hartford, Conn.
Counters, hub odometers
Vergilio Co., J. L., Erie Bldg., Cleveland, Ohio
Liquid meters
Veritas Firing System Co., P. O. Box 974, Trenton, N. J.
Seger cones
Vickers Inc., 1400 Oakman Blvd., Detroit, Mich.
Pumps & valving devices for control of power in oil-hydraulic systems
Victory Equipment Co., 844-50 Folsom St., San Francisco, Calif.
Absolute pressure gages
Viking Instruments Inc., Stamford, Conn.
Tachometers
Visco-Meter Corp., 315 Grote St., Buffalo, N. Y.
Viscosimeter
Voland & Sons, Inc., New Rochelle, N. Y.
Analytical balances & weights

W

Wadsworth Electric Mfg. Co., Inc., Covington, Ky.
Electric time switches
Wagner & Son, Carl H., 1944 N. Albany Ave., Chicago, Ill.
Thermometers
Walker & Co., Geo. T., 324 Fifth Ave., South, Minneapolis, Minn.
Laboratory supplies
Wallace & Tiernan Products, Inc., Belleville, N. J.
Chlorine control & chemical feed devices
Walser Automatic Timer Co., 420 Lexington Ave., New York, N. Y.
Timers
Waltham Dial Gage Co., 85 Myrtle St., Waltham, Mass.
Machinist's dial gages
Ward Leonard Electric Co., 31 South St., Mount Vernon, N. Y.
Resistors, rheostats, relays, motor starters, speed controllers, voltage regulators, electric control devices
Ward's Natural Science Estab., Inc., 302 N. Goodman St., Rochester, N. Y.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, Ohio
Telescopes
Warren-Knight Co., 136 N. 12th St., Philadelphia, Pa.
Surveying instruments & equipment
Warren Telechron Co., Ashland, Mass.
Timers & fractional horsepower motors
Water Leak Detector Co., 166 N. Third St., Columbus, Ohio
Water leak detectors
Water Level Controls Co., 765 Hampden Ave., St. Paul, Minn.
Liquid level controls
Watts Regulator Co., 10 Embankment St., Lawrence, Mass.
Automatic pressure regulating devices
Wayne Automatic Relay Co., 622 Wagner, Fort Wayne, Ind.
Photoelectric counters

Wi[illegible] Co., Earl, 4348 W. Roosevelt Rd., Chicago, I[illegible]
[illegible] set analyzers

We[illegible] Bros., Metal Works, 108 N. Jefferson St., Chicago, Ill.
Laboratory apparatus

We[illegible] Co., F., 1220 Buttonwood St., Philadelphia.
[illegible]thematical & surveying instruments

Weiner Thermometer Corp., 535 Pearl St., New York, N. Y.
Thermometers, hydrometers, psychrometers

Welch Engineering Service, F. M., Greenville, Ohio
Abrasion testing machines

Welch Scientific Co., W. M., 1515 Sedgwick St., Chicago, Ill.
Electrical instruments, vacuum pumps & items for science laboratories.

West & Dodge Thread Gauge Co., Inc., 791 Tremont St., Boston, Mass.
Screw thread gages

Western Electro-Mechanical Co. Inc., 300 Broadway, Oakland, Calif.
Load testing devices for a-c. circuits

Western Instrument Co., 5113 Kinsie St., Los Angeles, Calif.

Western Machinery Co., 306 W. Second St., Wichita, Kansas
Laboratory apparatus

Western Scientific Co., 1105 S. Main St., Los Angeles, Calif.

Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Electrical instruments

Westinghouse X-Ray Co. Inc., Long Island City, N. Y.
Industrial x-ray equipment

Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark, N. J.
Switchboard, panel & portable measuring instruments. Industrial & radio test equipment. Light measuring instruments & photographic exposure meters. Also dial type industrial temperature gages, control relays & aircraft instruments.

Wheaton Co., T. C., Millville, N. J.

Wheelco Instruments Co., 1933 So. Halsted St., Chicago, Ill.
Temperature, indicating, recording & control instruments; temperature limit & shut-off device; automatic combustion safeguards

White Co., Inc., David, 315 W. Court St., Milwaukee, Wis.
Surveying instruments

White Mfg. Co., 2362 University Ave., St. Paul, Minn.
Furnace controls

White-Rodgers Electric Co., 1209 Cass Ave., St. Louis, Mo.
Furnace controls

Wilcolator Co., 17 Nevada St., Newark, N. J.
Thermostats

Wilder Inc., R. S., 26 Bedford St., Waltham, Mass.
Microprojector

Wilder Sales Co., Drawer 70, Troy, N. Y.
Thermometers

Wilgus Mfg. Co., 1722 East 16th St., Los Angeles, Calif.
Diaphragm operated pressure regulators & combustion control equipment

Wilkening Mfg. Co., 1998 S. 71st St., Philadelphia, Pa.
Piston ring gages

Wilkens-Anderson Co., 111 N. Canal St., Chicago, Il.
Laboratory supplies

Will Corp., Rochester, N. Y.
Laboratory supplies & apparatus

Williams Apparatus Co., Inc., Herald Bldg., Watertown, N. Y.
Pulp & paper testing equipment & flue gas analysis apparatus

Williams, Brown & Earle, Inc., 918 Chestnut St., Philadelphia, Pa.
Laboratory supplies

Williams Gauge Co., 1620 Pennsylvania Ave., Pittsburgh, Pa.
Water level gages

Willson Products, Inc., Reading, Penna.
Anemometers

Wilson Mechanical Instrument Co., Inc., 383 Concord Ave., New York, N. Y.
Hardness testers

Winslow Co., Inc., 9 Liberty St., Newark, N. J.
Electrical instruments

Woermann-Schuchhardt, Inc., 17 W. 17th St., New York, N. Y.
Scientific instruments, optics, optical instruments, photographic products, polarizing instruments, precision meters, silent & sound motion picture apparatus

Wollensak Optical Co., 880 Hudson Ave., Rochester, N. Y.
Optical instruments

Woods "Lab. Apparatus", F. W., 140-6 Warden St., Pittsburgh, Pa.
Biological laboratory supplies

Woods Hole Oceanographic Inst., Woods Hole, Mass.
Oceanographic instruments

Worthington Gamon Meter Company, Harrison, N. J.
Liquid meters

Wright-Austin Co., 315 West Woodbridge St., Detroit, Mich.
Power specialties

Wyland, George C., Center St., Ramsey, N. J.
X-Ray tubes & cameras

X

Xervac Instrument Co., 9 New Park Ave., Hartford, Conn.
Scientific instruments

Y

Yarnall-Waring Company, 102 E. Mermaid Ave., Chestnut Hill, Philadelphia, Pa.
Water columns, water gages & blow-off valves for steam boilers, spray nozzles for liquids & hydraulic valves for presses

Yonkers Lab. Supply Co., 515 W. 132 St., New York, N. Y.
Laboratory supplies

Z

Zeiss, Inc., Carl, 485 Fifth Ave., New York, N. Y.
Optical instruments

Zenith Electric Co., 603 So. Dearborn St., Chicago, Ill.
Magnetic switches, work cycle timers

Zernickow Co., O., 15 Park Row, New York, N. Y.
Tachometers, Tachographs, Tachoscopes, cutmeters, stop watches

Zip Abrasive Co., Center & Washington Sts., Cleveland, Ohio
Tachometers

Zuhr, Inc., Henry, 187 Lafayette St., New York N. Y.
Laboratory test instruments

MANUFACTURERS' NEW LITERATURE

In this department we report ALL pieces of NEW literature pertaining to Instrumentation, received from the manufacturers. Readers may secure without cost (unless noted) any or all items reported here, by filling out and mailing the coupon.

I-1 **Temperature Instruments for Electric Power Equipment.** Catalog, 7¾" × 10½", 32 pages, describes and illustrates "Micromax" instruments and their use for various electric power applications. Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia, Pa.

I-2 **Du Mont "Oscillographer."** Vol. 4, Nos. 8 & 9, 4 pages, contains article entitled "The Cathode-ray Oscillograph as a Means of Demonstrating Elliptically Polarized Light" by Lawrence R. Steinhardt. Allen B. Du Mont Labs., Inc., 2 Main Ave., Passaic, N. J.

I-3 **Instruments for Measurement of Electronic Devices.** Booklet, 6" × 9", 16 pages, lists simultaneous vacuum tube voltmeter Model VG-11, microvolter, beat-frequency oscillator, signal generator, decibelometer, Model VG-6 vacuum tube voltmeter and audio spectrum divider. Televiso Products, Inc., 1135 North Cicero Ave., Chicago, Ill.

I-4 **Phototubes, Form PT-20R1,** 8½" × 11", 16 pages, contains complete information on phototubes and their applications for light-operated relays, color discriminating devices, automatic counters, for light measuring and for film sound reproduction. RCA Manufacturing Co., Inc., Camden, N. J.

I-5 **Industrial Analyzer.** Sheet, 8¾" × 11¼", 1 page, covers Model 77 a-c. power analyzer for complete power tests—3 phase, 2 phase and single phase. Measures values from ⅛ amp. to 300; watts from 15 to 240,000; voltages of circuits nominally 110-220-440-550. Niagara Electrical Instrument Co., 1 West Genesee St. Buffalo, N. Y.

I-6 **"The Story of Modern Industrial Weighing."** Broadside, catalogues complete line of scales—checkweighing, balancing, testing, counting, compounding and hand-weighing and their applications in industry. The Exact Weight Scale Co., Columbus, Ohio.

I-7 **Jet Pipe Regulator.** Bulletin No. No. 100A, 8½" × 11", 4 pages, describes and illustrates the jet pipe principle and construction and application of regulator. Askania Regulator Co., 1603 South Michigan Ave., Chicago, Ill.

I-8 **D-c Rectifiers.** Folder, 3⅝" × 8½", 6 pages, covers Model CR-2 for use on magnetic chucks, magnetic separators, pulleys and small d-c. motors; universal rectifiers in d-c. power capacities ranging from 400 to 1300 watts; Model M and three phase rectifiers. Mellaphone Corp., Rochester, N. Y.

I-9 **Radio and Electrical Test Equipment.** Catalog No. 124, 8½" × 11", 16 pages, introduces over 45 models of equipment, ranging from tiny pocket-type multi-purpose meter units, to large counter-type combination tube and set testers, including analysts, analyzers, trouble tracers, speed meters and highly flexible signal generator. Radio City Products Co., 88 Park Pl., New York City.

I-10 **Pyrometers.** Catalog No. 1101F, 8½" × 11", 32 pages, covers line of high speed photoelectric-action "Celectray" pyrometers, including indicators, indicating or recording controllers, recording and resistance thermometers; also price list. C. J. Tagliabue Mfg. Co., Park & Nostrand Aves., Brooklyn, N. Y.

I-11 **Reading and Magnifying Glasses.** Folder, 8½" × 11", 4 pages, describes and illustrates line of reading glasses, magnifiers, loupes and photographic thermometers. American Thermo-Ware Co., Inc., 16 Warren St., New York City.

I-12 **Instrument Panelboards.** Bulletin 8¼" × 10¾", 4 pages, describes and illustrates line of instrument panels — self-supporting cubicle-type, flat plate panel with structural supports, standard unit panel with stock supports and braces, special type draft gage board, etc. Falstrom Co., Passiac, N. J.

I-13 **Apparatus for Checking Thermocouple Pyrometers.** Catalog E-33A-503,

Clip and Mail this Coupon

INSTRUMENTS, Pittsburgh (JAN. 1941)

Please have the following catalogues, etc., reviewed in this issue sent to me.

Numbers .....

.....

I also desire further information concerning the following new products described in this month's "New Instruments" Department .....

.....

I also desire further information concerning the following products advertised in this issue (Write page number and name of company) .....

.....

Name ..... Firm name .....

Position ..... Address .....

7¾" ×10½", 28 pages, describes and illustrates portable equipment for plant tests under actual operating conditions and laboratory apparatus to standardize it. Leeds and Northrup Co., 4934 Stenton Ave., Philadelphia, Pa.

I-14 **General Radio "Experimenter."** Dec., 1940, 8 pages, contains items on Radio Frequency Characteristics of Decade Resistors, New Dial Plate and Using the Variac at Low Frequencies. General Radio Co., 30 State St., Cambridge, Mass.

I-15 **Portable Electrical Instruments,** Bulletin P-10-1, 8⅜" × 10¾", 8 pages, covers d-c. Model P-11 permanent magnet moving coil type voltmeters, millivoltmeters, microammeters, milliammeters, ammeters and volt-ammeters; a-c. Model P-12 moveable iron type, a-c. Model P-13 rectifier type and a-c. Model P-14 thermocouple type; portable testing shunts and electric tachometers. The Winslow Co., Newark, N. J.

I-16 **Binocular Magnifier.** Sheet, 6" × 9½", 1 page, describes and illustrates "Bi-Mag" 2X magnifier with working distance of approximately 4", distance from eye to lenses is 1½"; frame of durable fibre with hood for shading and protecting lenses; head band is adjustable. Price included. John Unertl, 75-B Cemetery Lane, Pittsburgh (9), Pa.

I-17 **Hob Checking Equipment,** Bulletin No. 464, 8½" × 11", 4 pages, describes and illustrates "Sine-Line" lead checker for hobs, contour checker and hob sharpening checker. Michigan Tool Co., 7171 E. McNichols, Detroit, Mich.

I-18 **Adiabatic Calorimeter.** Bulletin No. E-60, 8½" × 11", 6 pages, covers adiabatic oxygen bomb calorimeter for determining the heat of combustion of any solid or liquid material that can be completely burned in an oxygen combustion bomb, including coals, petroleum products, foodstuffs, organic compounds and numerous other carbonaceous materials. Parr Instrument Co., Moline, Ill.

I-19 **Controllers.** Combined Catalog and Text Book, 8½" × 11", 84 pages, covers complete line of self-operated controllers, combined temperature controllers with indicators, pressure controllers, wide-range indicating controllers, wide-range non-indicating controllers and controlographs. American Schaeffer & Budenberg Instrument Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.

I-20 **Oxygen Recorder.** Bulletin No. DW-2, 8½" × 11", 2 pages, describes and illustrates recorder which measures and records oxygen content of process gases, excess air in products of combustion and air in gas transmission systems. Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh, Pa.

I-21 **Temperature Control.** Bulletin, 8½" × 11", 4 pages, describes and illustrates "Econostat," an electric inside-outside temperature control system; includes typical operation chart and chart of methods of installation. Barber-Colman Co., Rockford, Ill.

I-22 **Immersion Thermoswitch.** Catalog Section 48, 8½" × 11", 2 pages, describes and illustrates thermoswitch, gives general specifications and lists prices. Fenwal, Inc., Ashland, Mass.

I-23 **Square Wave Analysis.** Folder, 8½" × 11", 4 pages, describes technique of analysis, shows figures illustrating square waves, low frequency cutoff, high frequency cutoff, transient oscillations and square wave modulation and covers Model 71 square wave generator. Measurements Corp., Boonton, N. J.

I-24 **Rotary Instrument Switches.** Bulletin SW, 8½" × 11", 1 page, covers Types "EN" and "BS" switches for instrument and industrial field; gives applications, construction data and general specifications. J-B-L Instrument Co., P. O. Box 135, Darby, Pa.

I-25 **"Bakelite" Molding Plastics.** Booklet, 8½" × 11", 32 pages, contains descriptions of compression and injection molding processes and explains essential differences between thermosetting (hot-set) and thermoplastic (cold-set) molding materials; physical, mechanical and electrical properties and characteristics of "Bakelite" phenolics, ureas, polystyrenes and acetates are enumerated in editorial and table form. Bakelite Corp, 30 E. 42nd St., New York City.

I-26 **Bore Checking.** Bulletin, 8¾" × 11", 4 pages, describes dial bore gages in standard, pistol-grip and vertical types, illustrations show gages being used to check inside diameters of aircraft engine parts; specifications and list prices included. Standard Gage Co., Inc., Poughkeepsie, N. Y.

I-27 **Burrell "Technical Announcer."** No. 40-117, 12 pages, contains articles on the interchangeable ground joint—a precision product in glass, lubrication of stopcocks, and a number of items on new laboratory equipment, including three-dimensional binocular microscopes. Burrell Technical Supply Co., 1935 Fifth Ave., Pittsburgh, Pa.

I-28 **Draft, Wind Box Pressure and Flue Gas Temperature Instruments.** Bulletin 33B2, 8½" × 11", 4 pages, covers two pointer type combination draft gage and flue gas temperature gage, three pointer type combination draft, wind box pressure and flue gas temperature gage, portable three pen recorder on 10" chart of furnace draft, flue gas temperature and wind box pressure, and two pen stationary and portable types recording draft gage and flue gas thermometer. Defender Automatic Regulator Co., 308 South 8th St., St. Louis, Mo.

I-29 **Manometers.** Bulletin No. 41, 8½" × 11", 1 page, describes and illustrates special types of double leg manometers for use as water or red oil gage or as a mercury gage. Prices included. Defender Automatic Regulator Co., 308 South 8th St., St. Louis, Mo.

I-30 **Rheostats.** Bulletin 1680, 7¾" × 10½", 6 pages, describes and illustrates "Jagabi Lubri-tact" porcelain tube rheostats for control of electric current in shop, laboratory and research work; metal cage types, screw-drive and switchboard types covered. James G. Biddle Co., 1211-13 Arch St., Philadelphia, Pa.

ADVERTISERS IN PART TWO

Aerovox Corporation 9
American Electrical Sales Co., Inc. 55
American Gas Accumulator Co. 42
American Transformer Company 17
Ames Company, B. C. 20
Amthor Testing Instrument Co., Inc. 54
Arca Regulators, Inc. 14
Automatic Temperature Control Co. 15, 59
Bailey Meter Company 7, 13, 14, 17, 19, 21
Becker, Inc., Christian 6
Betts & Betts Corporation 58, 59
Biddle Co., James G. 46
Bodine Electric Company 33
Boulin Instrument Corporation 48
Brabender Corporation 30, 36, 56, 62
Bradley Laboratories, Inc. 34
Bristol Company, The ..... Back Cover
Brown Instrument Company 13, 19, 25, 34, 37, 56
Brush Development Company, The 49
Buffalo Meter Company 29
Burling Instrument Company 12
Burrell Technical Supply Co. 5
Cambridge Instrument Company, Inc. 22, 25, 26, 27, 30, 32, 36, 67
Chelsea Clock Co. 9
Clare Company, C. P. 43
Clarostat Manufacturing Co., Inc. 11
Clifford Manufacturing Co. 6
Cochrane Corporation 19
Commercial Engineering Laboratories 62
Continental Electric Company 33, 60
Cornell Dubilier Electric Corp. ..... Inside Back Cover
Daven Company, The 44
De Jur Amsco Corporation 3
Dietert Co., Harry W. 54
Du Mont Laboratories, Inc., Allen B. 32
Eby, Inc., Hugh H. 33
Electric Tachometer Corporation 48
Electrical Research Products, Inc. ..... Inside Front Cover
Ellison Draft Gage Co. 24
Engelhard, Inc., Charles 23
Eppley Laboratory, Inc. 8
Ess Instrument Company 10
Falstrom Company 7
Federal Products Corporation 20
Fenwal, Incorporated 58
Ferner Company, R. Y. 53
Ferris Instrument Corporation 65
Field Electrical Instrument Co. 55
Fischer & Porter Co. 19, 24, 46, 60
Fisher Governor Company 15
Foxboro Company 13, 21, 29, 37, 56, 62
Gaertner Scientific Corporation 30
Geophysical Instrument Company 24
Glass Engraving Company 6
Gordon Co., Claud S. 36
Gotham Instrument Co. 57
Gow-Mac Instrument Company 23
Guardian Electric Mfg. Co. 42
Hart Moisture Gauges, Inc. 31
Hays Corporation, The 21, 23, 25
H-B Electric Company, Inc. 43
Heise Bourdon Tube Co., Inc. 23
Hickok Electrical Instrument Co., The 4, 20, 34
Impact Register Company, The 31
Indicating Calipers Corporation 8
Industrial Instruments, Inc. 53
International Resistance Company 45
Jarrell-Ash Company 47
J-B-L Instrument Co. 51
J-B-T Instruments, Inc. 37
Jensen Instrument Company 18, 34
Kessler Co., Walter H. 57
Kieley & Mueller, Inc. 40
Kollsman Instrument Co., Inc. 4
Kurman Electric Company, Inc. 43
Landis & Gyr, Inc. 5
Leeds & Northrup Co. 7, 10, 27, 34, 35, 48
Liquidometer Corporation, The 23
Lord Manufacturing Company 63
Mahoney, James A. 26
Marsh Corporation, Jas. P. 20, 55
Mason-Neilan Regulator Co. 12
Measurements Corp. 65
Merkle-Korff Gear Co. 27
Micro Switch Corporation 50
Minneapolis-Honeywell Regulator Co. 13, 19, 25, 34, 37, 56
New Jersey Meter Company 18
Nye, Inc., Wm. F. 33
Ohmite Manufacturing Co. 45
Palmer Co., The 55
Parr Instrument Co. 8
Perkins & Son, Inc., B. F. 73
Petrometer Corporation 22
Philadelphia Thermometer Co. 56
Photovolt Corporation 9
Pittsburgh Equitable Meter Co. 28
Pittsburgh Instrument & Machine Co. 54
Precision Resistor Company 44
Precision Thermometer & Instrument Co. 53
Precision Tube Co. 60
Pyrometer Instrument Co., The 40
Racine & Company, Jules 59
Rawson Electric Instrument Co. 30
Raytheon Manufacturing Co. 65
RCA Manufacturing Company 3
Refinery Supply Company, The 25
Rehtron Corporation 33
Republic Flow Meters Co. 17, 19, 40
Rex Rheostat Company 46
Riehle Testing Machine Div., American Machine & Metals Corp. 2
Ring Balance Instrument Co. 18
Roller-Smith Company 73
Rubicon Company 34
Rueckert Manufacturing Company 8
Ruehfel Company, George 26
Shallcross Manufacturing Company 41
Sola Electric Company 64
Spencer Lens Company 31
Standard Electric Time Company 48
Sticht & Co., Herman H. 50
Taber Instrument Company 53
Tagliabue Mfg. Co., C. J. 12, 13, 28, 36, 37, 55
Taylor Instrument Companies 11, 14, 16, 20, 21, 26, 27, 44, 56, 57, 58, 59, 60
Televiso Company 61
Thwing-Albert Instrument Company 38-39
Trimount Instrument Company 29
Uehling Instrument Company 16
United States Gauge Company 22
United Transformer Corporation 61
Ward Leonard Electric Company 43, 45
Weksler Thermometer Corporation 57
Weston Electrical Instrument Corp. 4, 42, 51, 54, 56, 65
Wheelco Instruments Company 14, 16, 44
Winslow Company, The 50, 62

Introducing a New Era in Testing!

- Measures insulation leakage up to 1000 megohms.
- Measures photo-cell voltages through high resistance circuits.
- Measures sensitive relay voltages without disturbing operation.
- Ideal for measurements and tests on all types of electronic devices.
- Meter fully protected on all d-c volts and ohms measurements.

RCA JUNIOR VOLTOHMYST
Only **$34.95** *complete with leads and probes*

For the first time in instrument history, all the features listed above have been combined in a single, low-cost instrument to herald a new era in testing!

Originally designed for radio circuit testing, the RCA JUNIOR VOLTOHMYST has proved unexcelled for use in all electrical fields where extreme sensitivity, accuracy and ruggedness are important factors. It utilizes the famous Rider VoltOhmyst electronic push-pull circuit. Thus, instead of being applied directly to the circuit under test, the meter is driven by the electronic circuit which, in turn, is energized from the circuit being tested.

By this means, the high input resistance of 11,000,000 ohms can be maintained on all d-c voltage scales, giving a maximum sensitivity of 3,666,666 ohms per volt. This extreme sensitivity also allows resistance measurements from 0.1 ohm to 1000 megohms. As maximum meter driving power is limited by the capabilities of the electronic circuit, full meter protection is obtained on d-c voltage and ohms measurements. A shielded lead with an isolated probe is furnished to insure negligible circuit disturbance during d-c voltage measurements.

SPECIFICATIONS

D-C VOLTMETER . . . 6 ranges of 0-3, 10, 30, 100, 300 and 1000 volts with a constant input resistance of 11,000,000 ohms. This permits true dynamic testing under actual operating conditions. Full meter protection.

OHMMETER . . . 6 ranges of 0-1000, 10,000, 100,000, 1,000,000, 10,000,000, 1,000,000,000 ohms. No zero reset required when changing scales. No leads to short. Full meter protection. All ohms read on one scale having low end expanded for greater accuracy.

A-C VOLTMETER . . . 5 ranges of 0-10, 30, 100, 300, 1000 volts. Isolated a-c circuit uses copper oxide rectifier giving 1000 ohms per volt sensitivity.

METER ACCURACY . . . 2% at full scale. Matched pair multiplier resistors accurate to 1%. Rugged meter movement; withstands mechanical shocks.

ASK FOR RCA CATALOG NO. 105—*Describes Junior VoltOhmyst, also the full line of RCA Oscillographs and Test Equipment for a wide variety of industrial needs.*

RCA Test Equipment

RCA MANUFACTURING CO., INC., CAMDEN, N.J. · A service of the Radio Corporation of America
In Canada: RCA Victor Co., Ltd., Montreal

RCA PREFERRED TYPE RADIO TUBES
For Finer Radio Performance